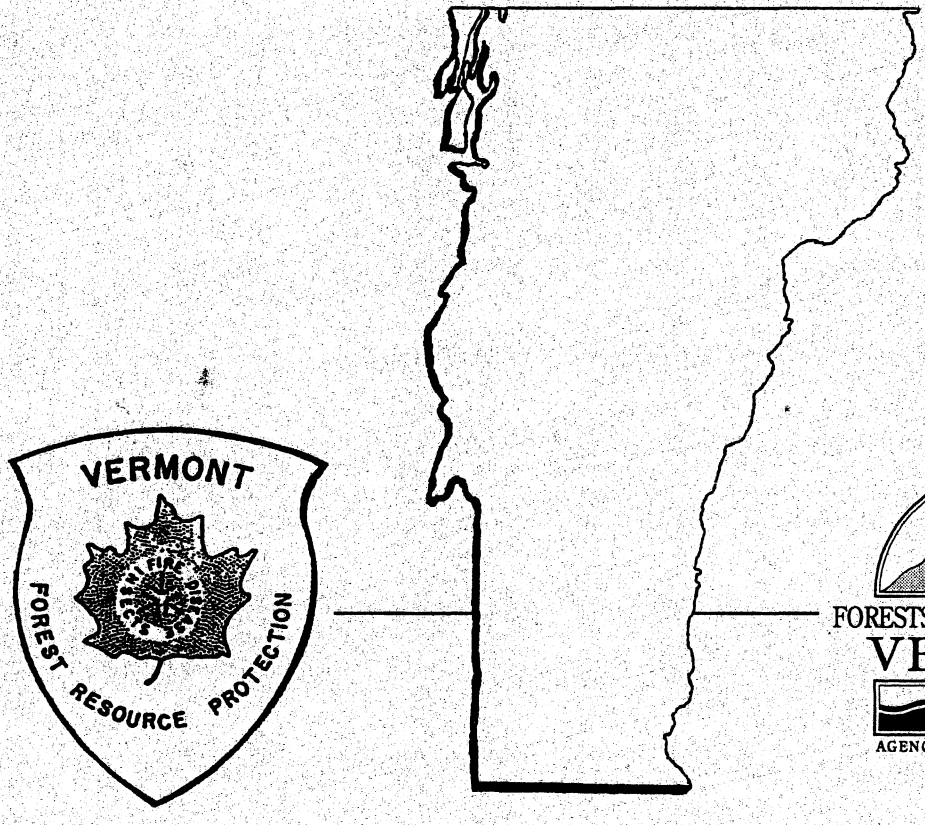
FOREST INSECT AND DISEASE CONDITIONS IN VERMONT 1997



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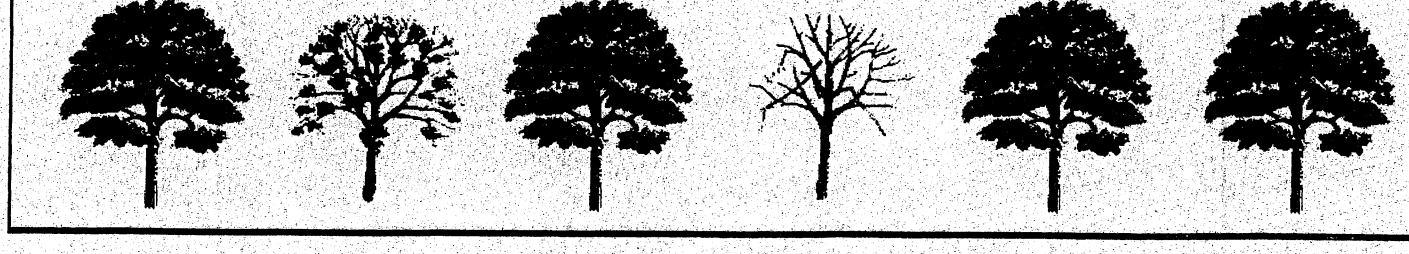

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FOREST INSECT AND DISEASE CONDITIONS IN VERMONT

CALENDAR YEAR 1997

PREPARED BY

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AGENCY OF NATURAL RESOURCES

DEPARTMENT OF FORESTS, PARKS AND RECREATION

Division of Forestry

Forest Resource Protection Section

TABLE OF CONTENTS

FOREST RESOURCE PROTECTION PERSONNEL 1

VERMONT INSECT AND DISEASE HIGHLIGHTS: 1997 3

VERMONT 1997 FOREST INSECT & DISEASE MANAGEMENT RECOMMENDATIONS 5

VERMONT FOREST HEALTH INSECT & DISEASE PUBLICATIONS: 1997 9

INTRODUCTION 11

WEATHER AND PHENOLOGY 12

OZONE SUMMARY 18

FOREST INSECTS

- HARDWOOD DEFOLIATORS 19
  - BIRCH DEFOLIATION 19
  - FOREST TENT CATERPILLAR 19
  - GYPSY MOTH 23
  - MAPLE LEAF CUTTER 25
  - SADDLED PROMINENT 28
    - OTHER HARDWOOD DEFOLIATORS 28
- SOFTWOOD DEFOLIATORS 33
  - SPRING HEMLOCK LOOPER 33
  - SPRUCE BUDWORM 33
    - OTHER SOFTWOOD DEFOLIATORS 35
- SAPSUCKING INSECTS, MIDGES, AND MITES 38
  - BALSAM GALL MIDGE 38
  - BALSAM TWIG APHID 38
  - OYSTERSHELL SCALE 38
  - PEAR THRIPS 39
  - PINE BARK ADELGID 40

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES 43
BUD, SHOOT & STEM INSECTS 47
ASIAN LONGHORNED BEETLE 47
BALSAM SHOOTBORING SAWFLY 47
OTHER BUD, SHOOT & STEM INSECTS 48
FRUIT/NUT INSECTS 51
ROOT INSECTS 51
BARK INSECTS 52
OTHER BARK INSECTS 57
INSECTS ASSOCIATED WITH DEAD AND DYING TREES 58
FOREST DISEASES
STEM DISEASES 59
BEECH BARK DISEASE 59
DELPHINELLA TIP BLIGHT 59
DIPLODIA (SPHAEROPSIS) TIP BLIGHT 59
SCLERODERRIS CANKER 59
OTHER STEM DISEASES 65
FOLIAGE DISEASES 68
ANTHRACNOSES 68
POPLAR LEAF BLIGHT 68
RHIZOSPHAERA NEEDLE DISEASE OF FIR 68
OTHER FOLIAGE DISEASES 69
ROOT DISEASES 72
DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES 73
ASH DIEBACK 73
AUTUMN SHEDDING 73
BIRCH DECLINE 73

BROWNING AND DEFOLIATION OF ASH AND OTHER HARDWOODS 74
HARDWOOD DECLINE AND MORTALITY 77
SPRUCE MORTALITY 80
WET SITE DIEBACK AND MORTALITY 80
WINTER INJURY OF RED SPRUCE 81
OTHER DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES . 81
ANIMAL DAMAGE 89
MISCELLANEOUS INSECTS AND FUNGI 90
INSECTS IN HOUSES AND BUILDINGS 90
PESTS OF HUMANS AND ANIMALS 94
PREDATORS AND PARASITOIDS 95
MISCELLANEOUS INSECTS 98
MISCELLANEOUS FUNGI 98
TREND IN FOREST CONDITION 99
FOREST BIOLOGY LABORATORY - 1997 101
HEALTH OF SUGAR MAPLE IN VERMONT - 1997 103
SUGAR MAPLE MANAGEMENT HIGHLIGHTS FOR THE REGION 105
COMMON PESTS OF CHRISTMAS TREES IN VERMONT - 1997 107

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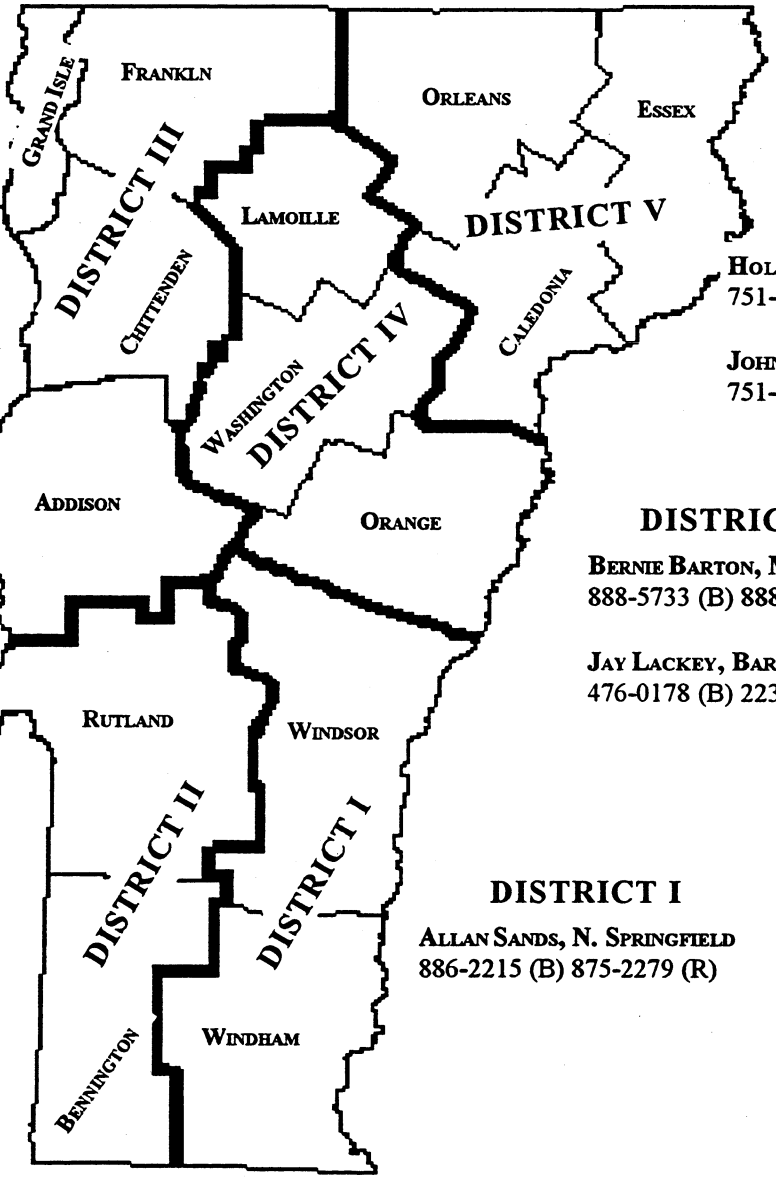

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1997 Forest Insect and Disease Highlights

Anthracnose was observed on a variety of hardwoods, including birch, maple, oak, and sycamore, but was generally less noticeable than in 1996.

Ash Dieback remains common, but none was mapped from the air.

Asian Longhorned Beetle has not been found in Vermont. Hundreds of beetles submitted by the public over the course of the summer as possible suspects were all confirmed to be other species.

Autumn Shedding and discoloration of older conifer needles, a natural occurrence, was more noticeable in northern Vermont Christmas trees than most years.

Balsam Gall Midge populations continued to increase statewide, with heavy damage occurring to some northern Vermont Christmas tree plantations.

Balsam Shootboring Sawfly populations declined dramatically. Populations may be depressed due to cool wet weather during the past two springs.

Balsam Twig Aphid damage decreased, with no heavily damaged plantations observed.

Beech Bark Disease continues to cause dieback and chlorosis, with about 3,200 acres of concentrated damage severe enough to be detected during aerial surveys. Tree condition remains stable in beech monitoring plots.

Birch Decline continues to be observed, particularly at upper elevations, but the area affected does not appear to be increasing. Tree health remains stable in plots established to monitor the impact of late season birch defoliation and other stressors.

Birch Defoliation caused by Birch Leaf Miners decreased, with only 3,842 acres mapped, compared to 47,500 acres in 1996. Damage was restricted to higher elevations in the Green Mountains.

Browning and Defoliation of Ash and Other Hardwoods was observed on over 450 acres in more than twenty locations in southern Vermont. The cause is unknown.

Delphinella Tip Blight of Fir has continued to be fairly common in northern Vermont balsam fir plantations, with heavy damage in some locations.

Diplodia Tip Blight caused widespread scattered shoot mortality of pine and fir.

Exotic Bark Beetle traps were deployed in eight locations, completing a statewide survey. No exotics were collected over the four years of the survey.

Forest Tent Caterpillar populations continued to be very low.

Gypsy Moth populations were very low with no visible defoliation detected, and none expected in 1998. The insect-pathogenic fungus, *Entomophaga maimaiga*, may be largely responsible for maintaining low populations throughout the Northeast.

Hardwood Decline and Mortality increased somewhat, with 26,256 acres mapped, compared to 10,440 mapped in 1996.

Maple Leaf Cutter caused some moderate to heavy defoliation in widely scattered locations statewide. Damage was mapped on 581 acres.

Oystershell Scale populations and dieback of affected beech decreased, with only a few acres mapped compared to 16,000 acres in 1996.

Pear Thrips populations were higher than seen in many years, but there was little damage to overstory trees. Thrips emergence in the spring was unusually late, but leaf development was even later. Overwintering populations in the soil in the fall remained low statewide.

Pine Bark Adelgid remains common, but less widespread than the last few years.

Poplar Leaf Blight caused widespread damage to balsam poplar, but not quaking aspen.

Rhizosphaera Needle Disease of Fir was widespread. Although damage was mostly light, some trees in scattered plantations became unsaleable. Spray trials were conducted in one plantation.

Saddled Prominent populations are building, especially in southern Vermont, although only occasional light damage was observed.

Scleroderris Canker has not been found in any new towns since 1986.

Spring Hemlock Looper was not observed. Recovery continues in Windham County stands that were heavily defoliated in 1991, and condition has stabilized in stands that were moderately damaged.

Spruce Budworm continued at low levels, with no visible defoliation detected.

Spruce Mortality and Dieback was mapped on 1,800 acres.

Wet Site dieback and mortality continues in perennially flooded sites. The acres affected are fairly stable.

Winter Injury of Red Spruce was mapped on 260 acres in Bennington County, but was uncommon, and light, elsewhere.

Vermont 1997 Forest Health Management Recommendations

The following recommendations summarize information in this report of particular importance to forest managers. Additional information can be found under specific pests mentioned. Separate summaries for sugarbush and Christmas tree managers are in the appendix.

For assistance in identifying pests, diagnosing forest health problems, on-site evaluations and insect population sampling, or to obtain copies of defoliation maps, management recommendations, and additional literature, contact forest resource protection personnel (page 1) or your county forester.

General — A number of recent years with mild winters, ample growing season precipitation, and few insect problems have led to good conditions for tree growth. Health monitoring surveys indicate that tree condition is remaining stable, on average, for a variety of species statewide. Consecutive wet springs, however, have caused foliage diseases to be widespread on some species, particularly where trees are located in low-lying areas or on regeneration whose foliage is close to the ground. Also, symptoms are still developing from dry conditions in 1995 on droughty sites or where trees were predisposed to decline by other stressors.

Maple — Maple continues to benefit from low populations of common defoliators. However, in the summer of 1997, light feeding of upper crown foliage by saddled prominent was widely encountered. As a mid-season defoliator, saddled prominent can cause more dieback and mortality than insects which feed at other times. An affected tree is not ready to shut down for the season, but does not have a chance to replenish depleted food reserves or to reverse hormonal changes in the bud which reduce winter hardiness. Sugar maple stands where thinning is scheduled should be visited in late July - early August of 1998 to determine whether significant defoliation is occurring. This is especially important in areas with a history of saddled prominent or where feeding has been observed. Thinning should be delayed if defoliation is occurring or expected to occur in a year or two. Pupal sampling in the fall or spring can provide some indication of whether saddled prominent will be present the following summer.

Scattered reports of woodland maple decline in 1997 provided a reminder that trees which are already affected by other stressors are particularly vulnerable to dry conditions, and that the symptoms brought on by drought may show up over a period of years. Decline occurred in some stands with heavy damage by sugar maple borer and where soil drainage was poor. Elsewhere, sapstreak showed up in trees with basal or root wounds and former twin trees whose partner had been cut. These trees had been infected at the time of wounding. Like Dutch elm disease, sapstreak clogs the xylem, and interferes with water movement, so a dry year can be devastating. Reduce the risk of sapstreak by insisting that operators avoid wounding residual trees, especially in spring and early summer jobs. Don't stack maple firewood in the woods, as sapstreak spores are produced on the cut surfaces of wood from infected trees.

Birch — Monitoring plots indicate that birch has tolerated successive years of late season defoliation. Again, ample moisture has helped this species, which is quite vulnerable to drought. As birch ages, expect mortality of this short-lived species from decay and breakage.

Beech — Oystershell scale, and the dieback it causes, have dropped. However, beech bark disease continues to hold its own. As always, favor the survival of individuals whose smooth stems indicate that they are resistant.

Ash — Ash is another species whose health remains steady, helped by recent weather. Previous episodes of ash dieback have been linked to dry years. In widely scattered spots in southern Vermont, ash was defoliated in summer of 1997 by an unknown stressor. Affected trees are expected to recover, and should not be salvaged. We are interested in learning of additional areas where ash browning is observed.

Butternut — Several projects are underway to develop butternut resistant to butternut canker. We have been assisting with these projects in locating trees with no disease, or only very light damage. If you know of such trees, please contact us.

Poplar — Many balsam poplars, particularly in riparian areas, received another defoliation by a leaf blight fungus. However, we have not observed any dieback associated with this damage. Other than reports of breakage of Hypoxylon-infected trees, poplar and aspen condition is generally good. Maintain adequate stocking in aspen stands, since Hypoxylon is more common on open grown trees. Know how to identify the disease, and remove cankered trees when thinning.

Oak — Growing conditions for oak continue to be good, with no significant problems observed on established trees, and no gypsy moth defoliation expected in the near future. Be cautious when interpreting reports that the fungus disease of gypsy moth, *Entomophaga*, has eliminated the threat of gypsy moth outbreaks. Remember that gypsy moth populations have plummeted in the past, and then rebounded, and that several consecutive wet springs have provided ideal conditions for the buildup of this fungus.

Fir — Consecutive wet springs have promoted the build up of normally innocuous fungus diseases on the foliage of fir Christmas trees. Some of the same diseases have been observed in forest stands, but should not be a problem. They have been observed only on regeneration and lower foliage. Although the damage can make Christmas trees unmerchantable, it should not affect forest tree health or productivity.

Spruce — Learn to identify yellow headed spruce sawfly, which was observed in 1997 on ornamentals and Christmas trees in widely scattered locations in Vermont. This insect has been at outbreak levels in Maine and the Maritime Provinces, causing heavy damage to black spruce plantations. It will also defoliate white and blue spruce.

White Pine — White pine continues to be healthy and productive. Pockets of mortality and unthrifty trees observed in 1997 underscore the need to make frequent inspections of high value stands.

Hemlock — Hemlock woolly adelgid is moving closer to Vermont. It has become established at a location just south of Route 2 in the Connecticut Valley of Massachusetts. We do not recommend altering hemlock management for a number of reasons. The insect is still not known to occur in Vermont. If or when it arrives, research at the University of Vermont suggests that our colder winter temperatures will impact adelgid survival. Research elsewhere in the eastern United States may change adelgid population dynamics; natural enemies are being imported from Asia and released into infested stands.

Vermont Forest Health Insect & Disease Publications: 1997

Bergdahl, D.R., R. Kelley, and H.B. Teillon. 1997. A twenty-five year history of Scleroderris Canker in Vermont, USA (1971-1996). IUFRO Foliage, shoot and stem diseases in forest trees, Quebec City, Quebec, Canada. Proceedings (Meeting May 1997).

SUMMARY

Scleroderris canker caused by *Gremmeniella abietina (=Ascocalyx abietina)* was first reported on red pine *(Pinus resinosa)* and Scots pine *(P. sylvestris)* in Vermont (VT) in 1971. The European race of G. abietina was isolated from Scots pine growing in Greensboro, VT in 1976. In 1977, VT initiated an annual statewide survey for G. abietina and then established a quarantine designed to prevent the movement of susceptible conifers outside infested areas. Since 1971, a total of 126 pine plantations (107 red pine and 19 Scots pine) have been found infested with G. abietina. All plantations are located in north central VT (in 64 of 251 towns) and total 997 acres. However, during the past 10 years (1986-1996), only one red pine and one Scots pine plantation have been added to the quarantine list. Today, most plantations exhibit only a trace amount of infection, and mortality caused by G. abietina is rare. We postulate that an infested nursery unknowingly played a role in dissemination of G. abietina because the county in which the nursery is located has the highest incidence of scleroderris canker in the state.

Keywords: *Gremmeniella abietina*, *Pinus spp.*, survey, nurseries

Bergdahl, D.R. and S. Halik. 1997. The butternut canker fungus recovered from insects collected on *Juglans cinerea*. IUFRO Foliage, shoot and stem diseases in forest trees. Quebec City, Quebec, Canada. Proceedings (Meeting May 1997).

SUMMARY

During the summers of 1994-1996, several insect species were collected from stems, logs and branches of butternut (*Juglans cinerea*) trees in northwestern Vermont and individually placed in sterile vials. Sterile distilled water was added to each vial and swirled before the insect was removed and sacrificed on an agar medium. The rinse water from each vial was then streaked on another agar plate. All plates were incubated for 14 days at 22C and then examined for *Sirococcus clavigignenti-juglandacearum* (SCJ), the butternut canker fungus. In 1994, SCJ was isolated from *Cossonus platalea* (3 of 67) and in 1995, from *Eubulus parochus (=Cryptorhynchus parochus)* (1 of 37). In 1996, SCJ was isolated from bodies of *Astylopsis macula (=Amniscus maculus)* (2 of 44), *C. platalea* (1/240) and *E. parochus* (4 of 181) and from vial rinse water of *A. macula* (11 of 45) and *E. parochus* (11 of 32). The remaining water in each vial was stained with trypan blue in lactic acid and examined microscopically. *SCJ conidiospores* were found in stained rinse water from *A. macula* (22 of 58), *C. platalea* (7 of 106) and *E. parochus* (34 of 63) but conidiospore viability was not determined. Most *A. macula* and *E. parochus* found carrying conidiospores of SCJ were collected from freshly cut logs or branches on which the beetles were mating and/or ovipositing. Also, conidiospores of *Melanconium oblongum* (Melanconis dieback fungus) were observed frequently on *A. macula* and E. parochus. Further studies are planned to determine the life cycles and the SCJ spore-vectoring potential of these beetles and other insects.

Keywords: *Sirococcus clavigignenti-juglandacearum*, *Juglans cinerea*, butternut canker, insect vectors

Gouli, S., B.L. Parker, and M. Skinner. 1997. Isolation of fungi from hemlock woolly adelgid (Homptera: Adelgidae). J. Invertebr. Pathol. 70:76-77.

Kelley, R.S., E.L. Smith, and S.M. Cox, 1998, Vermont Hardwood Tree Health in 1996 Compared to 1991 and 1986. In Press.

Parker, B.L. and M. Skinner. 1997. IPM of tree crops, Chap. 12 In T. Lewis [ed.], Thrips as Crop Pests. Academic Press, London. In press.

Parker, B.L., M. Skinner, V. Gouli, and M. Brownbridge. 1997. Impact of soil applications of *Beauveria bassiana* and *Mariannaea sp.* on non-target forest arthropds. Biol. Cont. 8:203-206.

Parker, B.L., M. Skinner, S. Gouli and H.B. Teillon. 1998. Survival of hemlock wooly adelgid (Homoptera: Adelgidae) at low temperatures. Forest Science. In press.

Skinner, M., and B.L. Parker. 1997. Pear thrips: a new pest in our northeastern forests. Proc. Philadelphia Soc. for Promoting Agric. Philadelphia, pp.1-36.

INTRODUCTION

The information in this report is based largely on aerial surveys to detect forest damage, as well as ground surveys and observations of Vermont Forestry Division staff.

One major aerial survey was flown this year. Some aerial and ground spot checks were conducted in early summer to determine if any pear thrips or other defoliation was visible. Since there was no defoliation detected then, aerial survey was delayed until late August to early September to target defoliation by maple leaf cutter and birch defoliators.

A survey of Christmas tree plantations is conducted annually in North-Central Vermont as part of the Scleroderris quarantine. This year, 261 acres were surveyed. Observations are made on all pests during this survey. Acreages reported for Christmas tree problems refer to changes in these surveyed plantations and are not statewide totals.

ACKNOWLEDGMENTS

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Finally, this document about current forest health, and the diagnostic and survey work required to produce it, would not be possible without support from the State of Vermont and from citizens who find the information useful.

WEATHER

A cold, snowy November, 1996, was followed by the warmest December on record for Burlington. The remainder of the winter was also mild (7th warmest on record for Burlington and 6th warmest for the state according to the NE Regional Climate Center), with frequent thaws. Despite the lack of any extreme cold, severe winter injury occurred to trees and shrubs that were marginally hardy for their location, due to the freeze-thaw events.

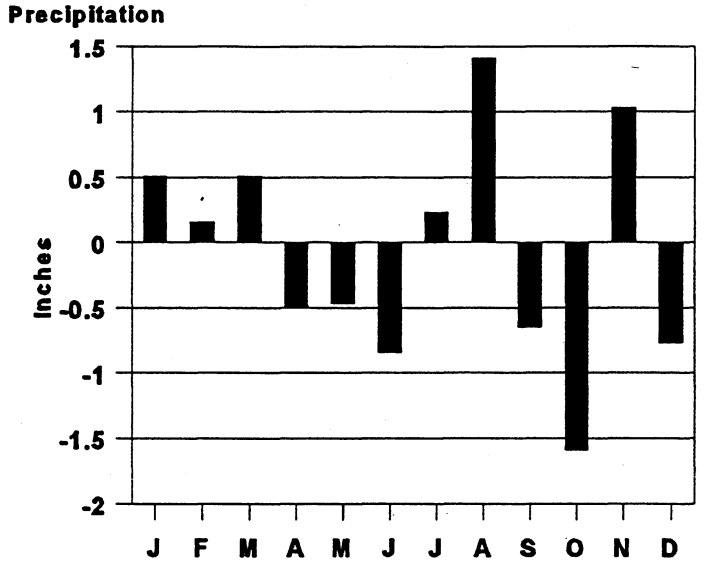
Heavy wet snows caused widespread storm breakage, especially in southeastern Vermont. There were 3 events with at least 15" of wet snow in 24 hours accompanied by winds over 60 mph.

Spring began late, and was generally cool and wet. The maple sugar season was late. Quality was good, but volume was variable. May was the 8th coldest on record for Vermont (NE Regional Climate Center). Rainfall was frequent but averaged near normal in amount. Killing frosts were not a problem, although there was a hard frost in southwestern Rutland County on May 20. Budbreak and flowering of trees and shrubs were much delayed, averaging about 10 days later than normal. Black locust was still thin in mid June.

The growing season averaged slightly cooler than normal and just above normal for precipitation, despite some short-term dry periods (10 days) in some locations. There was little extremely hot weather. On July 15, a severe thunderstorm dropped an average of about 6 inches of rain over much of Franklin, Orleans, and Lamoille Counties. This caused severe flooding, especially in Montgomery and Wolcott.

Autumn weather was warm, with abundant sunshine. Foliage onset was 1-2 weeks late. Fall foliage quality was excellent (especially white ash) and lasted well.

Generally, the forest looked healthy from the air. There was a heavy pine cone crop, with heavy pollen. Seeds for butternut were scarce. Beechnut production was very spotty. No beechnut mast was observed in beech plots in Victory. There were fewer acorns than 1996. Acorns were a little more common from oaks at the higher elevations. There was a medium spruce cone crop noted in Walden. Sugar maple seed was light and scattered. Wild apple production was spotty, possibly affected by cool, wet spring and low honeybee populations. Statewide weather conditions are summarized in Figure 1. Phenology is summarized in Table 1 and Figures 2-3.



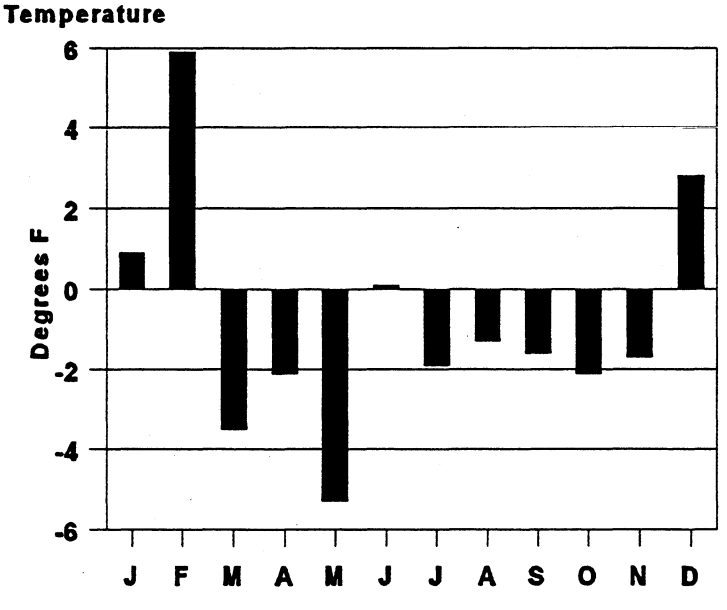


Figure 1. Departure from normal of 1997 precipitation and temperature at Burlington International Airport. Data from NOAA Local Climatological Data: Monthly Summary.

Table 1. 1997 Growing degree day accumulations and first observation dates of phenological development in 4 sites in Vermont. 50°F used as the threshold of development.

Biological Indicator	Barre	Springfield	Stowe	Underhill
PLANT DEVELOPMENT				
Showing Green				
Balsam fir	36 (5/15)	27 (5/15)	23 (5/12)	21 (5/20)
Budbreak				
Balsam fir		33 (5/21)	37 (5/15)	27 (5/27)
Fraser fir			148 (6/3)	
Hemlock		53 (5/26)	85 (5/29)	91 (6/2)
Lilac			0 (4/24)	
Red oak		13 (5/8)		
Sugar maple	15 (4/30)	13 (5/2)	15 (5/2)	16 (5/6)
White ash		18 (5/12)	31 (5/13)	21 (5/20)
White birch		13 (5/2)		
Flowers				
Dolgo crab			85 (5/29)	
Elm		2 (4/20)		
Lilac		53 (5/26)	178 (6/6)	145 (6/7)
Poplar		2 (4/16)		
Red maple		2 (4/16)	0 (4/27)	
Shadbush		13 (5/8)	42 (5/18)	25 (5/24)
Sugar maple				21 (5/20)
Silver maple		2 (4/7)		
Tartarian honeysuckle			204 (6/8)	
Full green up		148 (6/8)		
INSECT DEVELOPMENT				
Eastern tent caterpillar nest		33 (5/21)		53 (5/29)
Maple leafcutter adult			137 (6/2)	
Pear thrips adults	43 (5/23)	7 (4/30)	37 (5/16)	3 (4/11)
Plum curculio adults			287 (6/12)	
Balsam gall midge				
1st adults laying eggs			51 (5/23)	
Peak emergence			85 (5/29)	
Balsam shootboring sawfly				
Adults present			8 (4/30)	
Several adults on late-breaking balsam			109 (5/31)	
50% of larvae dropped			358 (6/17)	
Peak larval drop from late-breaking balsam fir			166 (6/5)	
Balsam twig aphid egg hatch			31 (5/13)	
OTHER OBSERVATIONS				
First peepers calling			0 (4/17)	

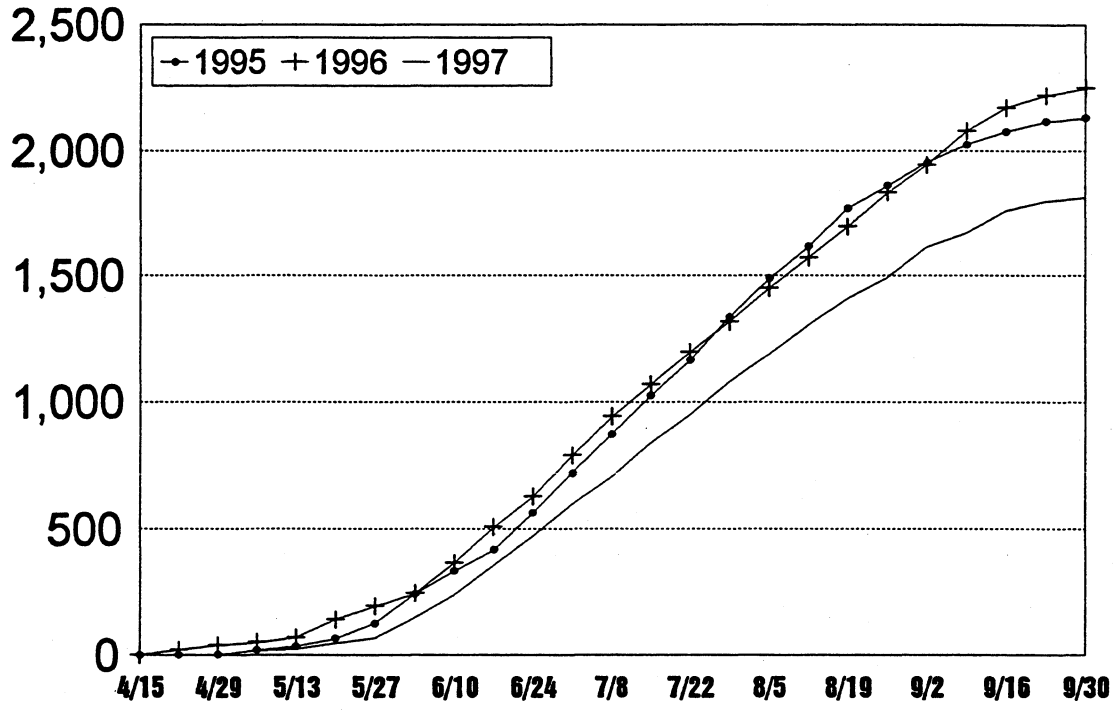
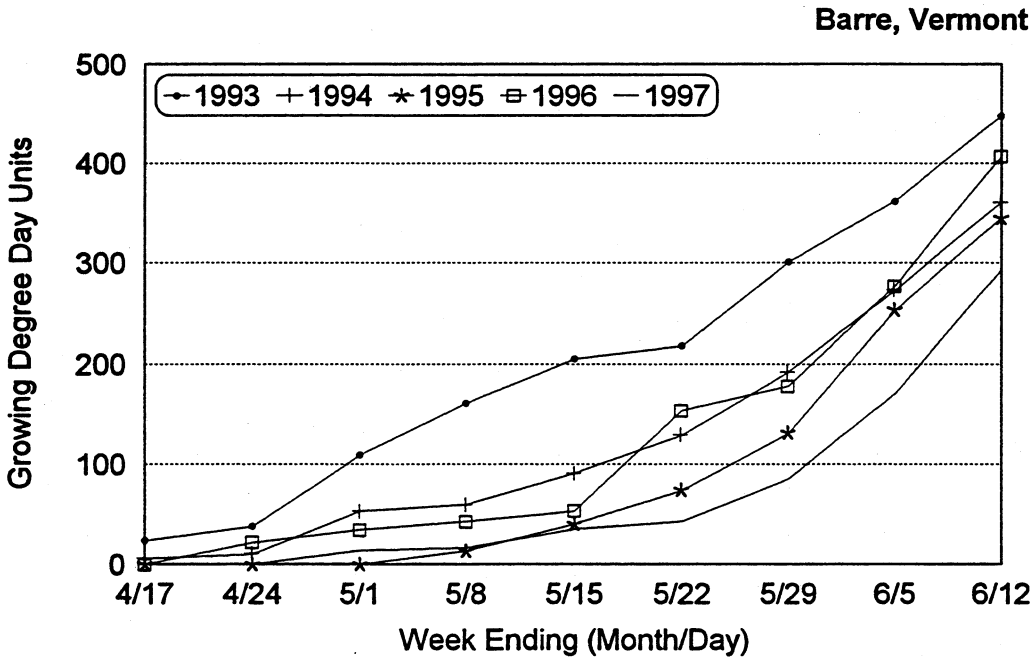
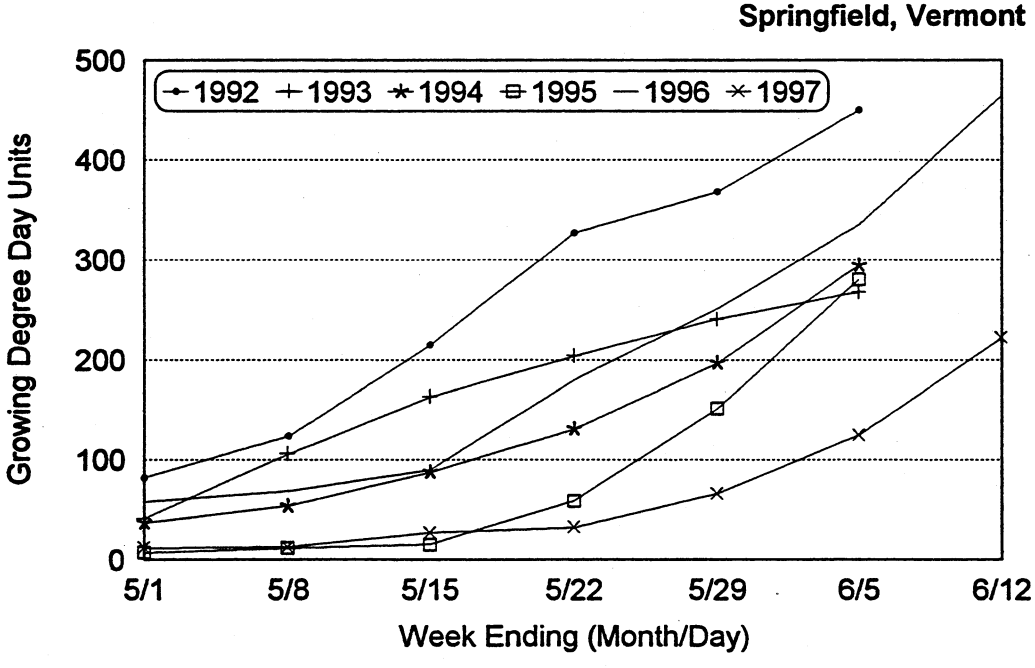


Figure 2. Weekly cumulative growing degree days throughout the 1995-1997 growing seasons at Stowe. 50°F used as the threshold of development.


Barre, Vermont
1993
1994
1995
1996
1997
500
400
300
200
100
0
Growing Degree Day Units
4/17
4/24
5/1
5/8
5/15
5/22
5/29
6/5
6/12
Week Ending (Month/Day)


Springfield, Vermont
1992
1993
1994
1995
1996
1997
500
400
300
200
100
0
Growing Degree Day Units
5/1
5/8
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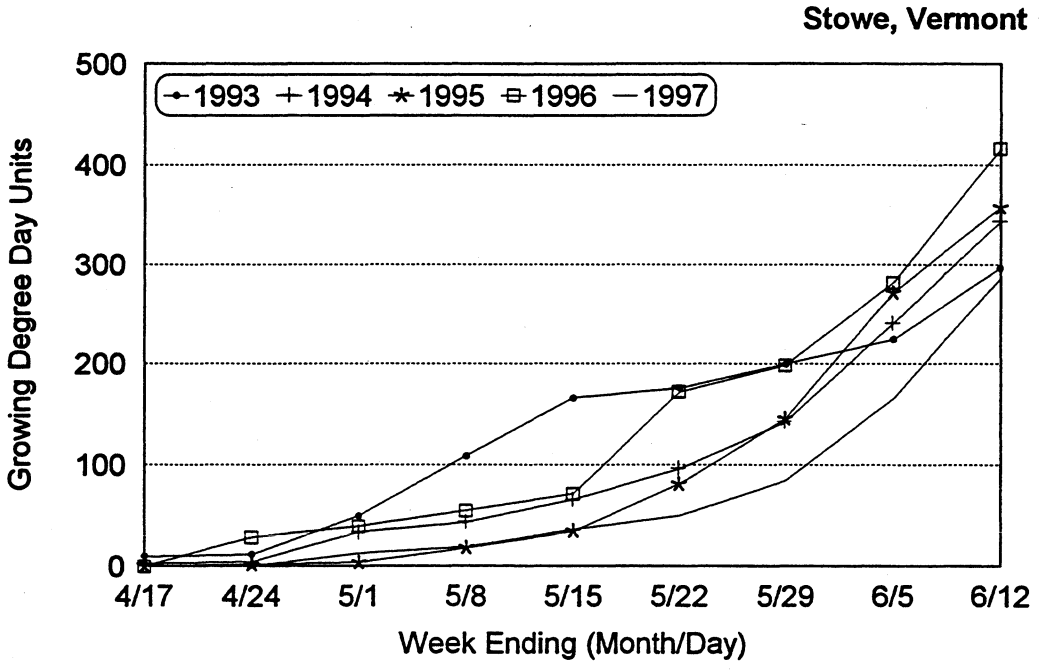
5/22
5/29
6/5
6/12
Week Ending (Month/Day)



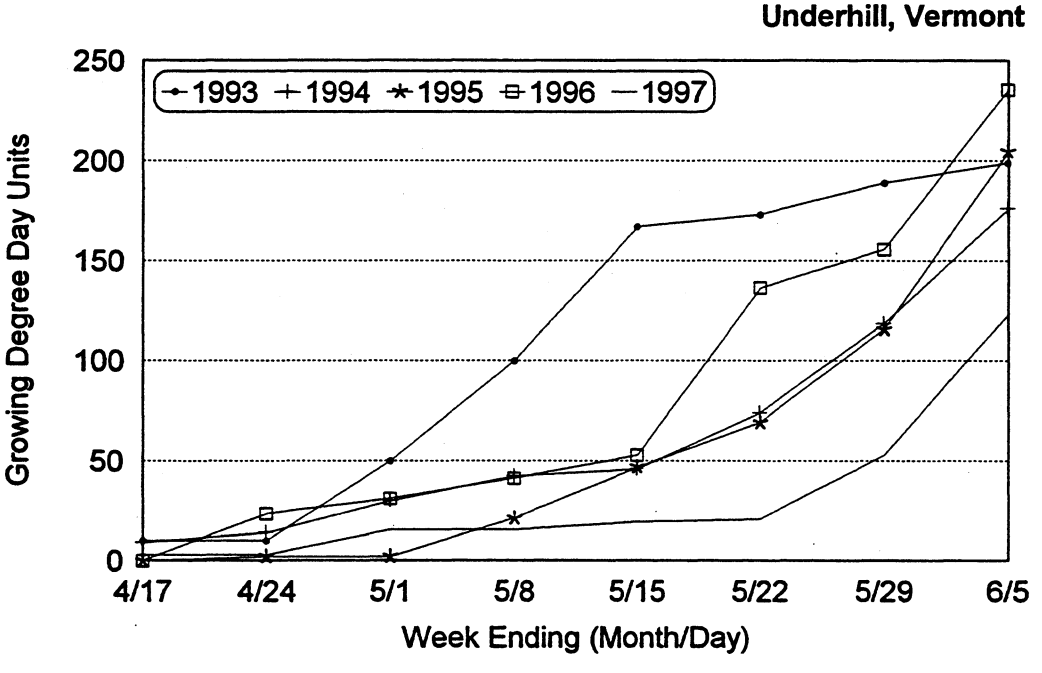


Figure 3. Weekly cumulative growing degree days at 4 locations by year through 1997. 50°F used as the threshold of development.

OZONE SUMMARY

The maximum ozone levels at both Vermont stations (Table 2) were lower this year than in 1996, and below the National Ambient Air Quality Standard of 0.124 ppm for 1 hour, a level set for the protection of human health. Uptake of ozone by sensitive plant species was more site specific than in other years. In general, where plant growth was vigorous, ozone uptake resulted in injury.

There are many different ways to express ozone data so that they are more meaningful to plant health. Ozone levels that adversely affect sensitive plant and tree species (i.e. black cherry and white ash) are from 0.060 to 0.080 ppm. The number of hours greater than 0.060 or 0.080 ppm, the SUM06, and the SUM08 are all indices used to relate ozone levels with potential plant injury. These indices reflect a cumulative exposure to ozone levels that are known to cause damage to sensitive plant species.

Most plant-related ozone indices at both sites were higher this year than in 1996, indicating the potential for greater damage to sensitive plant species. Ozone exposure in parts of southern Vermont tends to be greater than in northern Vermont.

Table 2. Ozone levels recorded during the 1997 growing season at two stations.**

Monitor Site	Total Number of Hours with		Maximum Level		SUM06 (ppm-hr)	SUM08 (ppm-hr)
	≥0.060 ppm	≥0.080 ppm	ppm	Date		
Underhill	210	2	86	8/10	13.9	1.17
Bennington	332	41	106	6/30	23.0	3.57

Data provided by the Vermont Air Pollution Control Division

Forest Insects

HARDWOOD DEFOLIATORS

Birch Defoliation, caused by **Birch Leaf Miners**, *Fenusa pusilla* and *Messa nana*, decreased, with only 3,842 acres mapped during the annual aerial survey compared to 47,500 acres of birch defoliation (including birch skeletonizer) mapped in 1996 (Figure 5, Table 3). Addison County, with about 2,500 acres mapped, had the most visible defoliation. Damage was restricted to higher elevations in the Green Mountains.

Birch defoliation, caused by a number of defoliating agents, has been widespread since the mid 1980s. However, birch condition in Vermont remains stable (see birch dieback and Vermont Hardwood Health Survey). The extent of defoliation has been variable from year to year (Figure 4), because a number of defoliating agents are involved. Dry conditions in 1995 made damaged leaves shrivel early, while wet conditions in 1996 led to widespread leaf fungi.

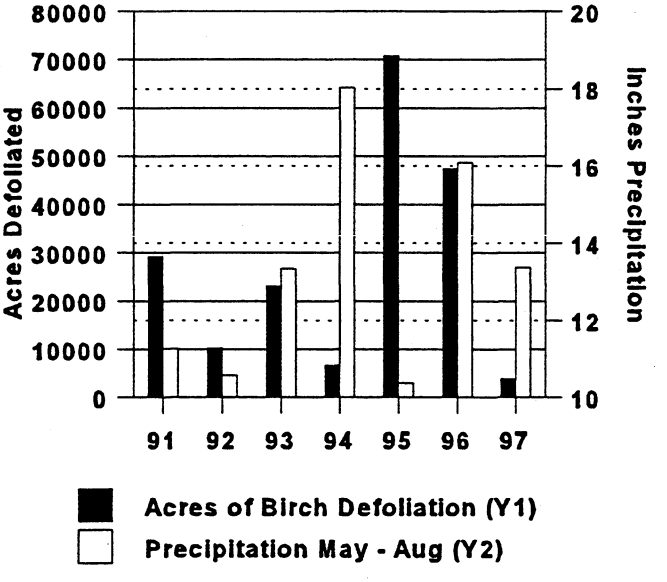
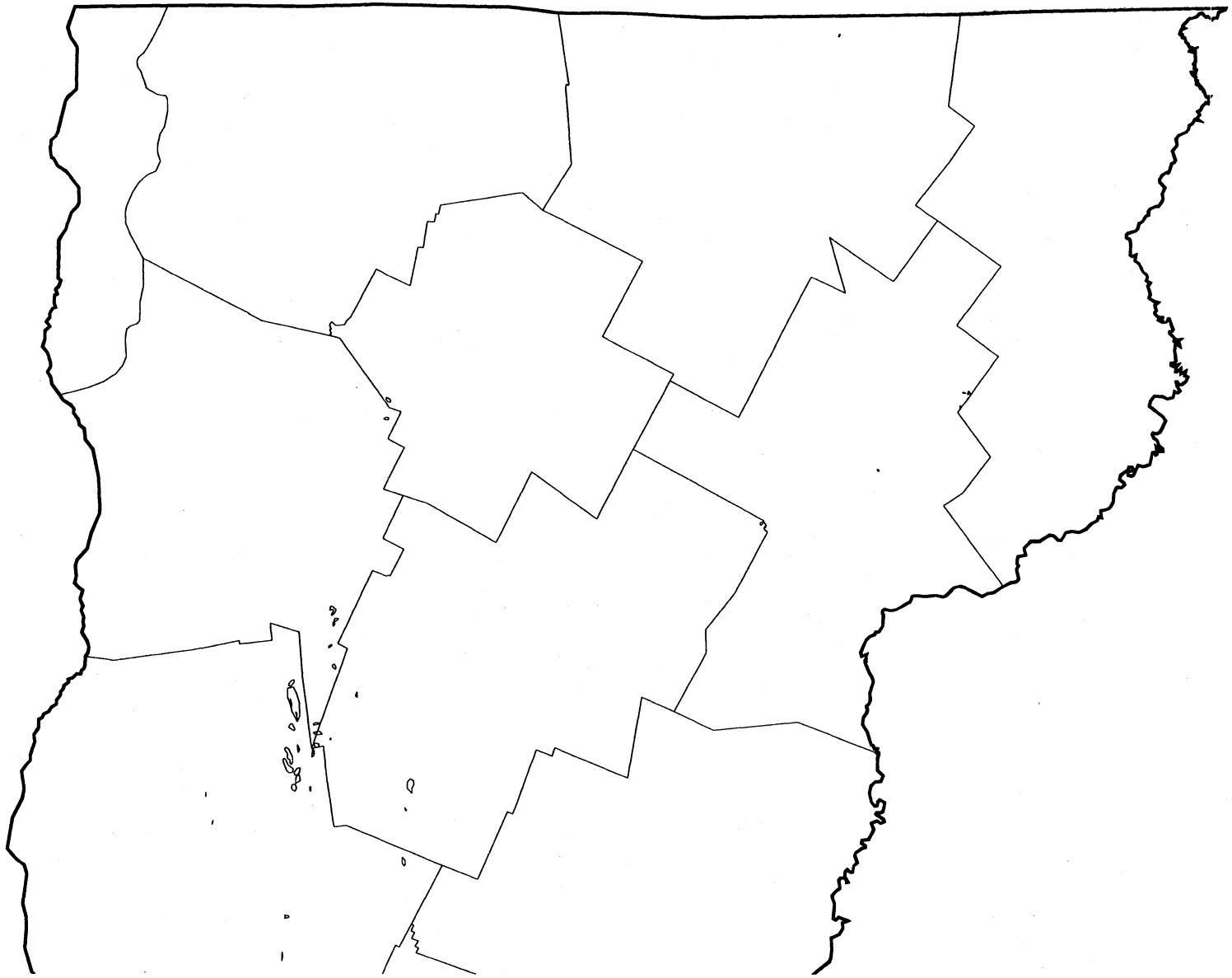


Figure 4. Mapped acres of birch defoliation in Vermont and inches of precipitation in May through August recorded at Burlington by NOAA, 1991-1997.

Forest Tent Caterpillar, *Malacosoma disstria*, populations continued to be very low this year, and no forest defoliation was observed. Caterpillars were seen only occasionally. No moths were caught in pheromone traps (Figures 6-7). No moths were caught in a Luminoc light trap in Hyde Park with a blue light plus pheromone for four hours per night. In 1995, 27 moths were trapped.

BIRCH LEAFMINER



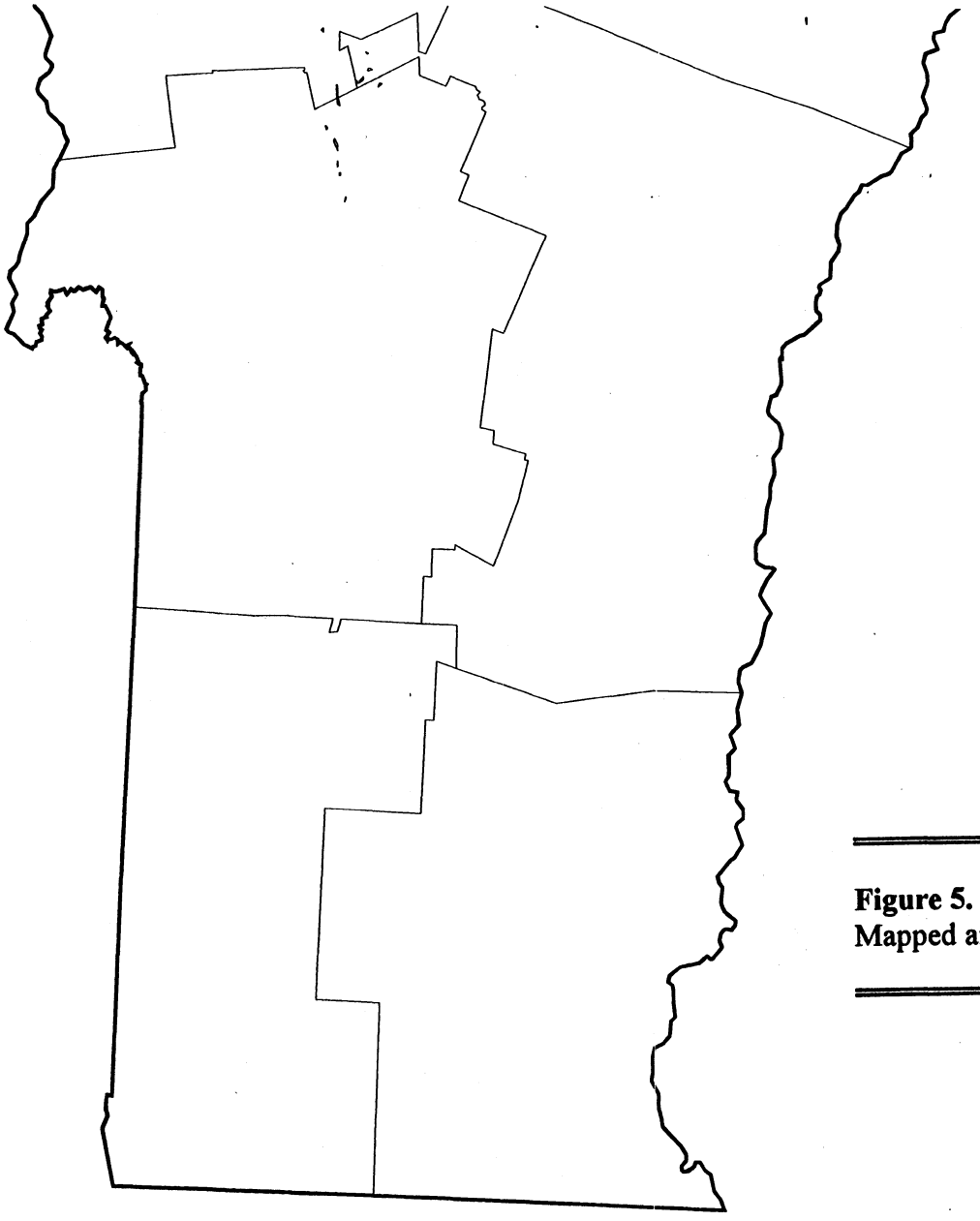


Figure 5. 1997 Birch defoliation by birch leaf miner. Mapped area is 3,842 acres.

Table 3. Mapped acres of birch defoliation caused by birch leaf miners in 1997.

County	Light-Moderate	Heavy	Total
Addison	420	2,072	2,492
Bennington	—	9	9
Caledonia	13	52	65
Chittenden	134	263	397
Lamoille	70	—	70
Orange	24	—	24
Orleans	19	—	19
Rutland	220	—	220
Washington	376	72	448
Windsor	89	9	98
Total	**1,365**	**2,477**	**3,842**

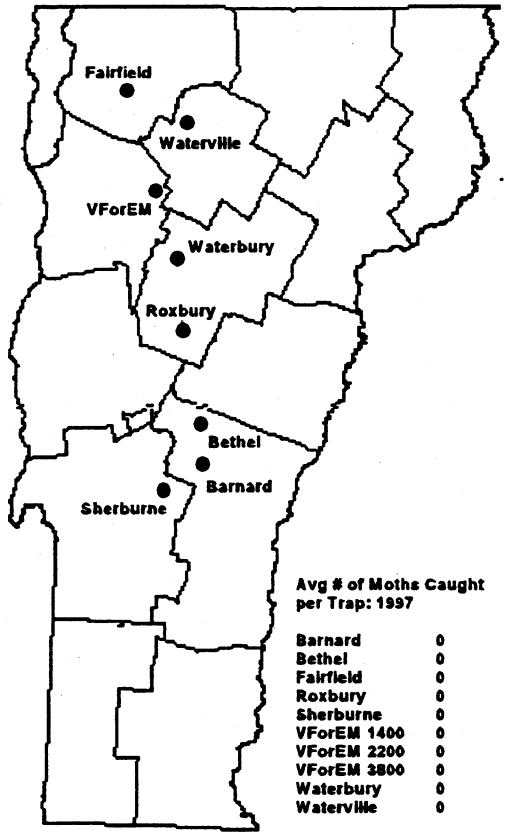


Figure 6. Average number of forest tent caterpillar moths caught in pheromone traps, 1997.

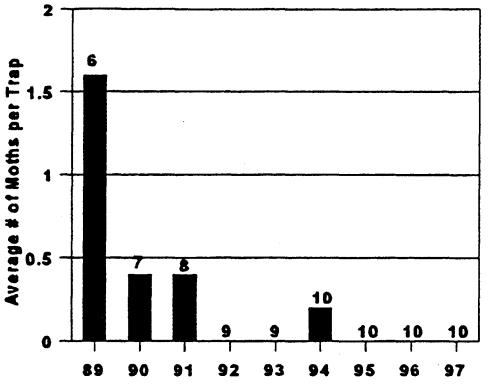


Figure 7. Average number of forest tent caterpillar moths caught in pheromone traps 1989-1997. Number above bar indicates number of Vermont locations with traps. Five multi-pher traps baited with RPC-2 component lures per location.

Gypsy Moth, *Lymantria dispar*, populations were very low. Although some homeowner complaints were received in 1996, none were received this year and no defoliation was detected. The insect-pathogenic fungus, *Entomophaga maimaiga*, may be largely responsible for maintaining low gypsy moth populations throughout the Northeast. Egg mass counts in focal area monitoring plots were the lowest since 1987 when the plots were established (Figures 8-9). No visible defoliation is expected in 1998. A total of four egg masses were counted in six "control" plots outside of the traditional focal area locations, but no egg masses were observed on non-burlap-banded trees outside the plots.

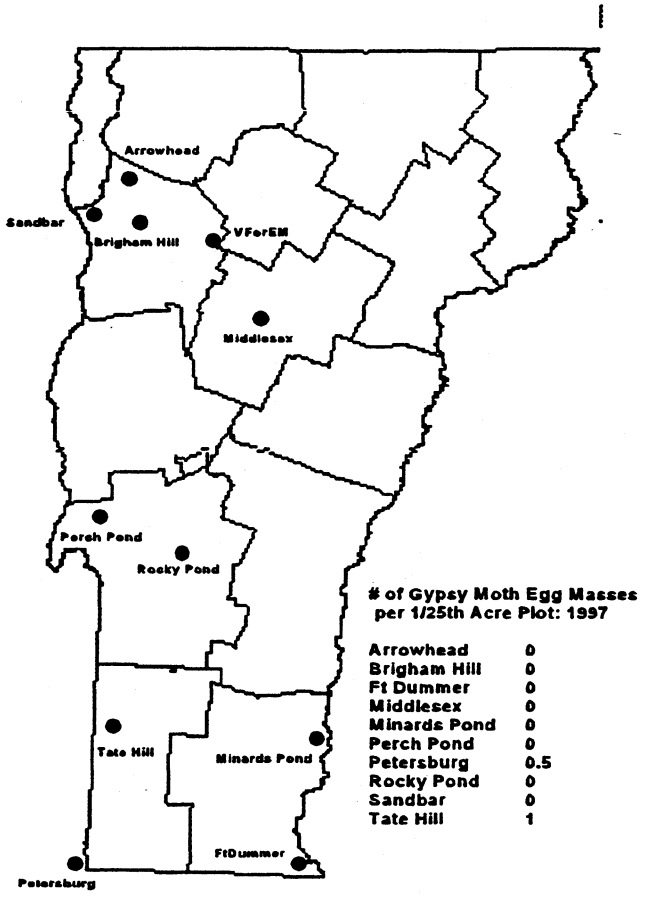


Figure 8. Gypsy moth egg mass counts from focal area monitoring plots, 1997. Average of two 15m diameter burlap-banded plots per location.

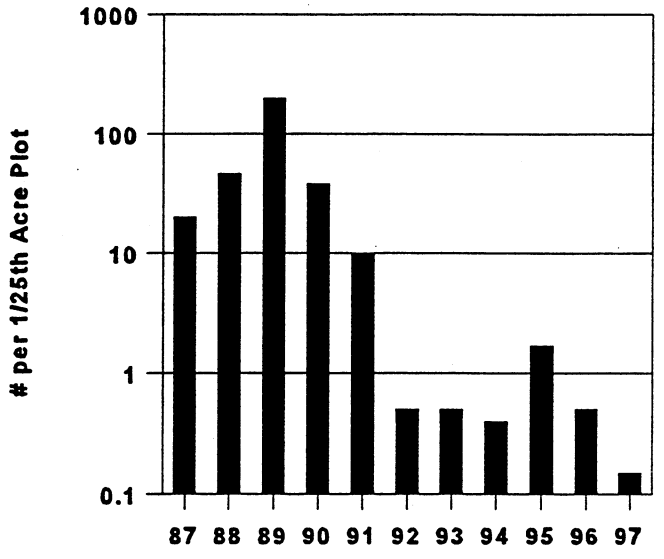


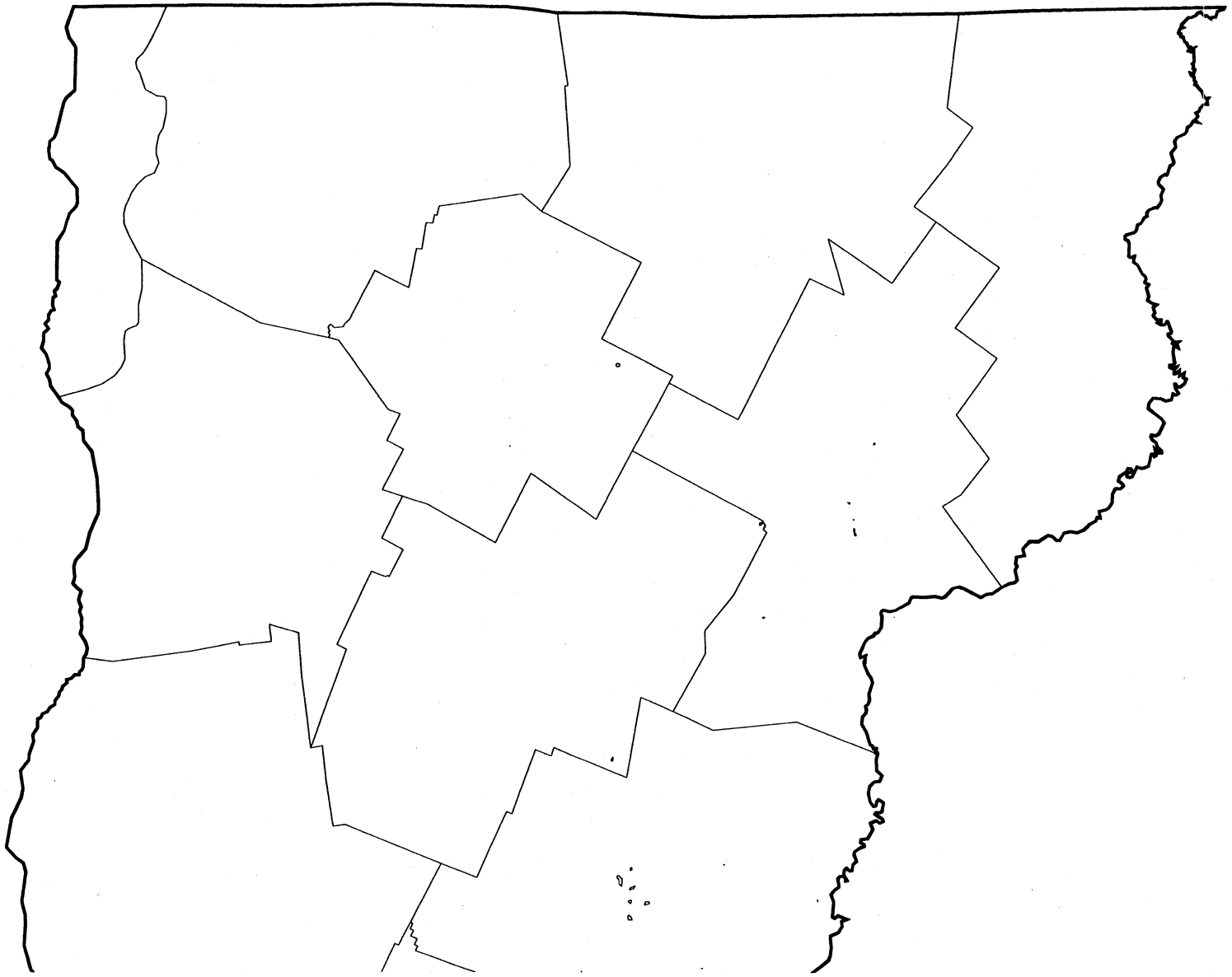
Figure 9. Average number of gypsy moth egg mass per 1/25th acre (15m diameter) burlap-banded plots 1987-1997. Average of 10-12 locations per year, 2-3 plots per location.

Maple Leaf Cutter, *Paraclemensia acerifoliella*, caused some moderate to heavy defoliation in scattered locations in Lamoille, Washington, Orange, Bennington and Caledonia counties with 581 acres mapped during aerial survey (Figure 10, Table 4). Species damaged in Bennington County included red oak and ironwood. Elsewhere, there was only light damage to lower crown foliage.

Table 4. Mapped acres of maple leaf cutter in 1997.

County	Light-Moderate	Heavy	Total
Addison	—	16	16
Caledonia	47	34	81
Lamoille	38	—	38
Orange	27	391	418
Washington	—	28	28
Total	**112**	**469**	**581**

MAPLE LEAFCUTTER



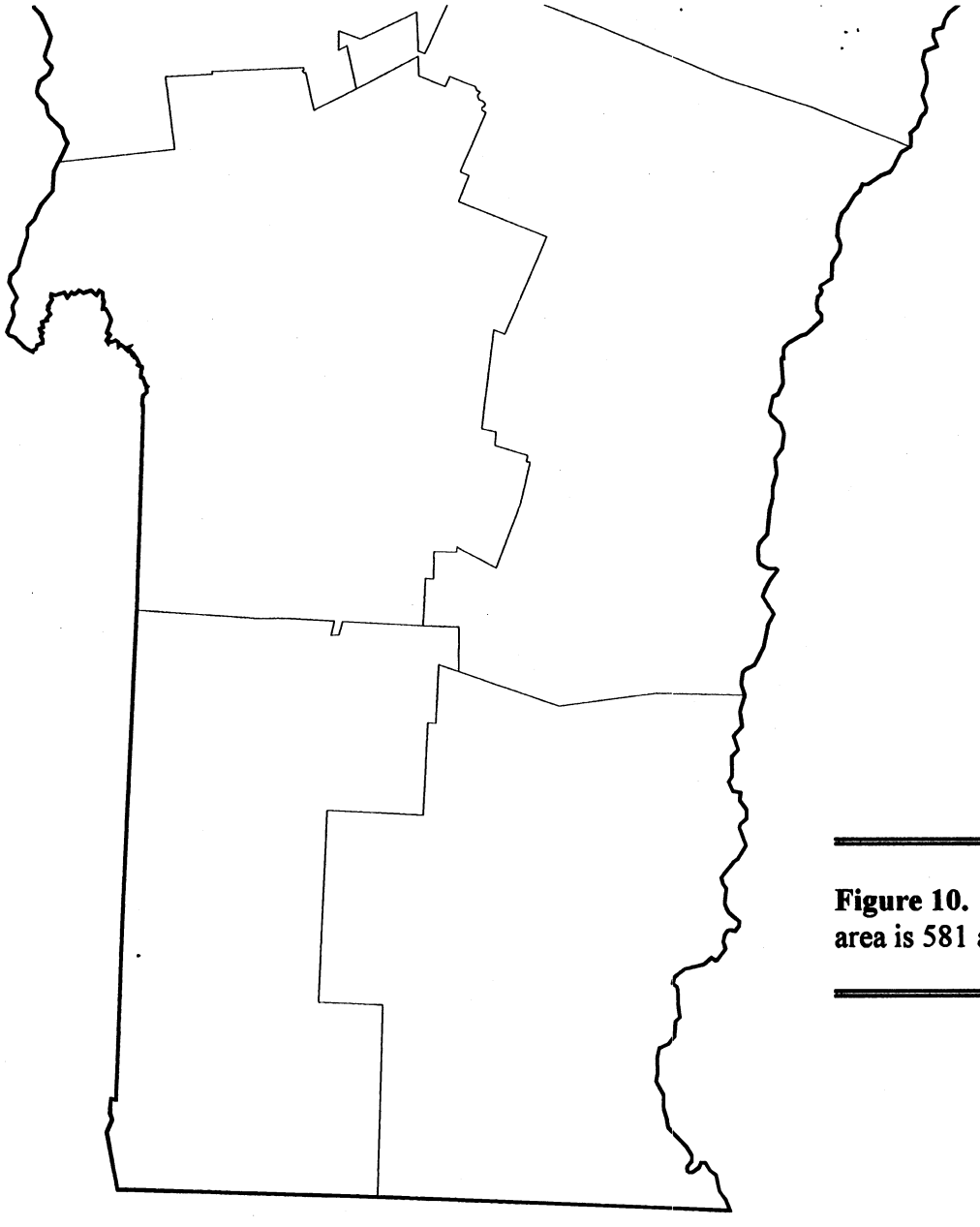


Figure 10. 1997 Damage by maple leaf cutter. Mapped area is 581 acres.

Saddled Prominent, *Heterocampa guttivata*, populations are building, especially in southern Vermont, although only occasional light damage was observed and no damage was mapped during aerial surveys. Most feeding occurred at mid-elevations in upper crowns. Many larvae observed had no "saddle" markings. Pupal sampling along the Slack Hill Trail in Plymouth indicated that populations there will continue to be light in 1998 (1 pupa/40 ft^2 sampled).

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Alder Leaf Beetle *Altica ambiens alni*	Alder	Caledonia & Orleans Counties	Scattered defoliation, especially in East Haven and Newark.
American Dagger Moth *Acronicta americana*			Not observed.
Birch Leaf Folder *Ancylis discigerana*	Yellow Birch	Lamoille, Orleans & Caledonia Counties	Very light damage.
Birch Leaf Miner *Fenusa pusilla*			See narrative.
Birch Skeletonizer *Bucculatrix canadensisella*	Paper Birch	Bennington, Essex, Caledonia, Washington & Lamoille Counties	Mostly trace to light damage at higher elevations. The only area of any significance was on Burke Mountain.
Blister Beetle *Pomphopoea sayi*	Cherry Apple	Newport	Several individuals on host trees.
Bruce Spanworm *Operophtera bruceata*	Sugar Maple	Throughout	Moderate damage to 10 acres in Lyndon. Scattered - light. Elsewhere, decreasing from 1996. Only light understory feeding.
Cherry Scallop Shell Moth *Hydria prunivorata*	Black Cherry	Widespread	Especially common in Champlain Valley. Scattered elsewhere on ornamental, forest and hedgerow trees.
Dogwood Sawfly *Macremphytus tarsatus*	Dogwood	Morrisville	Heavy populations on occasional trees.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Early Birch Leaf Edgeminer			See narrative on Birch Defoliation.
Messa nana			
Eastern Tent Caterpillar	Cherry Apple	Throughout	Light; populations low.
Malacosoma americanum			
Elm Leaf Beetle	Elm	Rutland County	Heavy along Otter Creek.
Pyrrhalta luteola			
Elm Leaf Miner	Camperdown Elm	Graniteville	Light feeding.
Fenusa ulmi			
Elm Leaf Tier	Slippery Elm	Wallingford	Light feeding.
Canarsia ulmi			
Euonymous Caterpillar *Yponomeuta cagnagella*	Spindletree	Bennington Norwich Morrisville Manchester	Ornamentals, heavy on individual shrubs.
European Snout Beetle *Phyllobius oblongus*	Sugar Maple	Stowe Underhill Center Highgate	Ornamentals
Fall Cankerworm *Alsophila pometaria*	Red Maple Cherry	Addison County	First observation in many years.
Fall Webworm *Hyphantrea cunea*	Black Cherry Elm Birch Other Hardwoods	Widespread	Populations continue to be high along road and field edges in the Connecticut Valley, Wells, and Poultney.
Forest Tent Caterpillar *Malacosoma disstria*			See narrative.
Green Striped Mapleworm *Anisota rubicunda*			Not observed in the larval stage, but moths were common.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Gypsy Moth *Lymantria dispar*			See narrative.
Half Winged Geometer *Phigalia titea*			Not observed.
Imported Willow Leaf Beetle *Plagiodera versicolora*	Willow	Rutland County Champlain Valley	Some heavy damage along riparian areas.
Japanese Beetle *Popillia japonica*	Many	Widespread	Some moderate-heavy damage. Populations heavier than in 1996 in some locations, but larvae were developmentally delayed.
Large Aspen Tortrix *Choristoneura conflictana*			Not observed.
Lilac Leaf Miner *Caloptilia (=Gracillaria) syringella)*	Lilac	Graniteville	Ornamentals.
Linden Looper *Eranis tilaria*			Not observed.
Locust Leaf Miner *Odontata dorsalis*	Black Locust	Putney, Hartland, Chittenden & Lamoille Counties.	Damage visible in July. Very heavy by September in areas where damage occurs annually.
Maple Basswood Leaf Roller *Sparganothis pettitana*	Sugar Maple	Scattered throughout	Very light.
Maple Leaf Cutter *Paraclemensia acerifoliella*			See narrative.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Maple Leafblotch Miner *Cameraria aceriella*	Sugar Maple	Caledonia, Orleans, Washington, Lamoille & Franklin Counties	Common, but less abundant than in 1996.
Maple Trumpet Skeletonizer *Epinotia aceriella*	Sugar Maple	Throughout	Increasing. Many home-owner calls late in the season. Some moderate damage.
Maple Webworm *Tetralopha asperatella*	Sugar Maple	Springfield Bridport Orwell	Light feeding.
Mountain Ash Sawfly *Pristiphora geniculata*	Mountain Ash	Danville Ryegate Colchester	Ornamentals.
Oak Leaf Tier *Croesia semipurpurana*			Not observed.
Oak Skeletonizer *Bucculatrix ainsliella*	Red Oak	Middlesex Waterford Bethel Rupert Wells	Light, scattered.
Orange-humped Mapleworm *Symmerista leucitys*			Not observed.
Pear Slug Sawfly *Caliroa cerasi*	Cherry Apple	Chester	Ornamentals.
Red-humped Oakworm *Symmerista canicosta*			Not observed.
Rose Chafer *Macrodactylus subspinosus*	Many	Widely scattered	Common, but not as heavy as in some years.
Saddled Prominent *Heterocampa guttivata*			See narrative.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Satin Moth *Leucoma salicis*	Poplar	Bellows Falls	Suspected cause of early defoliation in highway median strip.
Spiny Elm Caterpillar *Nymphalis antiopa*	Willow	Lamoille County	Individual larvae.
Spring Cankerworm *Paleacrita vernata*	Hardwood	Springfield	Unconfirmed observation of larvae.
Tortoise Beetle *Plagiometriona clavata*	Oak Morning Glory	Bristol Duxbury	Numerous on a few plants.
Uglynest Caterpillar *Archips cerasivoramus*	Cherry	Widely scattered	Light -few sightings. Similar to 1996.
White Marked Tussock Moth *Orgyia leucostigma*	Hardwoods	Widely scattered	Larvae observed late in season.
Willow Flea Beetle *Rhychaenus rufipes*	Willow	Lamoille & Washington Counties	Very common.
Wool Sower Gall *Callirhytis seminator*	White Oak	Addison County	Observed as a curiosity.
Yellow-lined Caterpillar *Nadata gibbosa*	Beech	Norwich	Found in area with frass falling in August.

SOFTWOOD DEFOLIATORS

Spring Hemlock Looper, *Lambdina athasaria*, was not observed. Recovery continues in Windham County stands that were heavily defoliated by the looper in 1991, and tree condition has stabilized in stands which were moderately defoliated (Figure 11). A few defoliated trees remain in very poor condition, and are expected to die eventually.

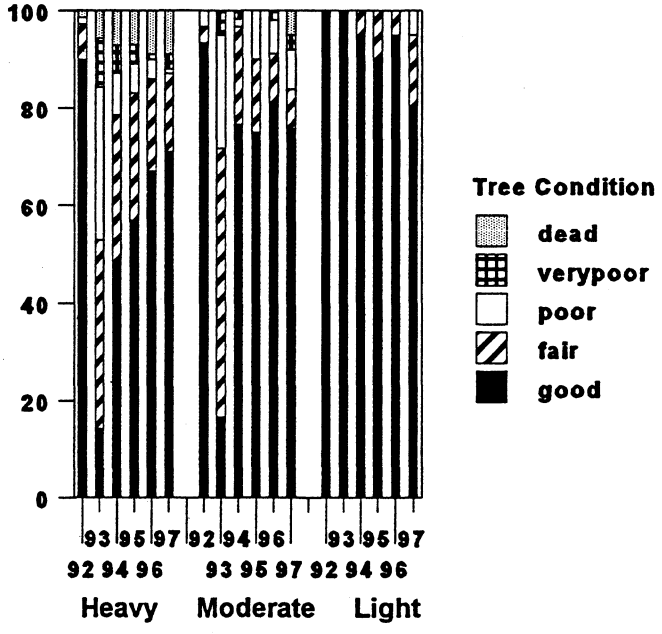
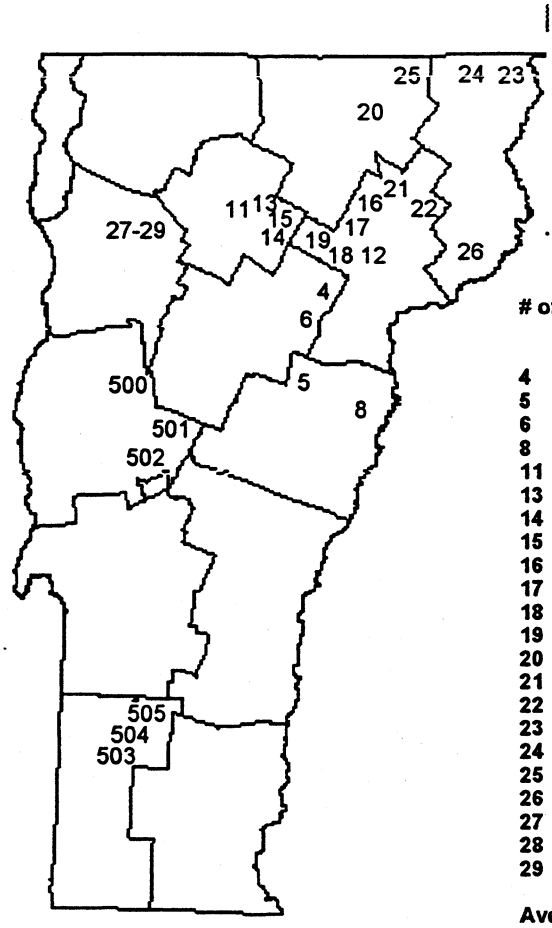


Figure 11. Percent of trees in spring hemlock looper impact plots in each of five condition classes when evaluated in spring of 1992-1997, by defoliation severity in 1991. Data are from ten trees in each of seven stands which had heavy defoliation, six which had moderate defoliation, and two which had no defoliation.

Spruce Budworm, *Choristoneura fumiferana*, continued at low levels, with no visible defoliation detected. The number of moths captured in pheromone traps in northern Vermont has been fluctuating at low levels. Trap counts this year were lower than in 1996 but similar to 1995 levels (Figures 12-13).



# of Spruce Budworm Moths per Trap: 1997

4	Danville Hill	6.0
5	Reservoir	6.3
6	Marshfield Pond	1.3
8	Scotch Hollow	2.7
11	Centerville	6.3
13	Diggins	4.7
14	Wolcott F&G	1.3
15	Bear Swamp	2.7
16	Withers	1.0
17	Mason	1.0
18	Star School	2.0
19	Beagle Club	1.0
20	Brownington Pond	3.7
21	Calendar Brook	3.7
22	Chieppo	3.7
23	Bunnel Brook	0.0
24	Norton Cemetary	1.3
25	Holland Pond	1.3
26	Victory Bog	1.7
27	VForEM 1400	3.7
28	VForEM 2200	1.7
29	VForEM 3800	6.7
Average (excluding 28 & 29)		2.8

Figure 12. Spruce budworm pheromone plot locations and average number of moths caught per trap in 1997.

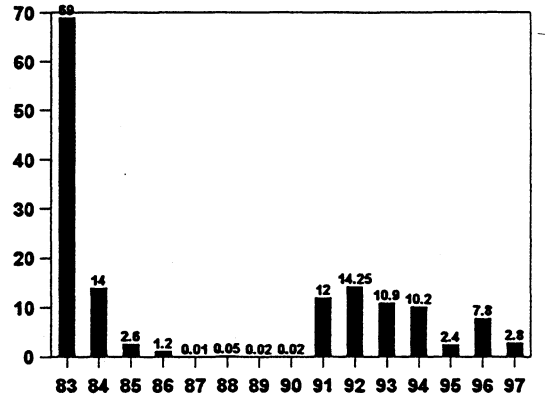


Figure 13. Average number of spruce budworm moths caught in pheromone traps by year, 1983-1997.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Arborvitae Leaf Miner *Argyresthia thuiella*	Northern White Cedar	Widespread	Heavy on occasional ornamental and nursery plants in southern Vermont. Elsewhere, similar to 1996 causing scattered light damage.
Balsam Fir Sawfly *Neodiprion abietis*			Not observed.
European Pine Sawfly *Neodiprion sertifer*	Scots Pine	Springfield	Suspected cause of damage to ornamentals.
European Spruce Needleminer *Taniva albolineana*	Blue Spruce	Westminster	With Rhizosphaera, causing heavy defoliation on ornamentals.
European Spruce Sawfly *Diprion hercyniace*	Blue Spruce	Brattleboro	Ornamental.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Fall Hemlock Looper *Lambdina fiscellaria*			Not observed. Pheromone trapping discontinued.
Fall Webworm *Hyphantrea cunea*	Fraser Fir	Morrisville	Infesting Christmas tree adjacent to an apple tree.
Introduced Pine Sawfly *Diprion similis*	White Pine	Springfield	Empty pupal cases, probably from this insect, were easy to find on downed branches in the fall. Undetected during Christmas tree survey for first time in many years.
		Richford	A few larvae seen. Light defoliation.
Larch Casebearer *Coleophora laricella*	Eastern Larch	Widely scattered	Mostly light damage to natural stands noticed except for heavy damage on 20 acres in Hardwick and some moderate damage in Morrisville. Observed on planted larch in Woodstock.
Larch Sawfly *Pristophora erichsonii*			Not observed.
Nursery Pine Sawfly *Diprion frutetorum*			Not observed.
Pine False Webworm *Acantholyda erythrocephala*	White Pine	Brattleboro	A few larvae seen.
Pine Tube Moth *Argyrotaenia pinatubana*	White Pine	Brattleboro	Ornamental.
Pine Webworm *Tetralopha robustella*			Not observed.
Red-headed Pine Sawfly *Neodiprion lecontei*			Not observed.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Spring Hemlock Looper			See narrative.
Lambdina athasaria			
Spruce Bud Moth			Not observed.
Zeiraphera canadensis			
Spruce Budworm			See narrative.
Choristoneura fumiferana			
Spruce Coneworm	Blue Spruce	Bennington	Ornamental.
Dioryctria reniculelloides		Westminster	Light, scattered feeding in Christmas trees.
Spruce Needleminer	Blue Spruce	Newport	Moderate damage to ornamental.
Archips sp.			
White Pine Sawfly			Not observed.
Neodiprion pinetum			
Yellow-headed Spruce Sawfly	Blue Spruce White Spruce	Lunenburg Washington Bennington Pittsford Barre Marshfield Cabot	Ornamentals and Christmas trees. Some trees heavily defoliated.
Pikonema alaskensis			

SAPSUCKING INSECTS, MIDGES, AND MITES

Balsam Gall Midge, *Paradiplosis tumifex*, populations continued to increase statewide again this year. Damage was detected in nearly all of the balsam fir Christmas tree plantations surveyed in northern Vermont. Damage in some locations was the heaviest seen in many years, with nearly every needle in the upper third of some tree crowns galled. Outbreaks of gall midge are very cyclical and have been peaking every seven years in most locations. 1998 will be the seventh year since the last outbreak. Dissections of galled needles from two heavily-infested plantations revealed that about 20% of the galls contained the non-gall-making midge that ends up controlling the gall-maker. The beneficial midge should increase next year and reduce damage in the year 1999. However, damage is likely to peak in 1998 and be heavier in most locations.

Growers who had damage this year should monitor their trees for adult midges laying eggs soon after bud break in 1998. If adults are present in noticeable numbers, they should be prepared to treat their trees after adults are done laying and new growth in the upper third of the crowns of favored trees averages 1½ to 2 inches long.

Balsam Twig Aphid, *Mindarus abietinus*, damage decreased in 1997. Damage in the balsam fir Christmas tree plantations surveyed was mostly moderate (70% of acres surveyed), with some trace to light damage. Unlike 1996, no plantations surveyed were heavily damaged. Stem mother counts just before budbreak were much higher than in 1996, but the resulting damage was lighter than seen in 1996. Balsams from seven different seed sources in one Woodbury lot were evaluated in 1996 and 1997 for number of stem mothers and percent of branches damaged. An average of 1.5 aphids/sq. ft. in 1996 resulted in 86% of branches injured while 8.2 aphids/sq. ft. in 1997 resulted in 70% of branches injured. This indicates that factors other than number of aphids can play a large role in the amount of needle curling that occurs. It seems likely that the unusually cloudy, wet weather during shoot elongation in 1996 kept plant tissues succulent, and contributed to the heavy damage seen. Our Elmore weather station, six miles from the Woodbury lot, received rain on 24 of the 42 days from May 20 (82% budbreak for Woodbury balsams) through June 30, 1996.

Oystershell Scale, *Lepidosaphes ulmi*, populations on American beech decreased in most locations, as did dieback heavy enough to be detected by aerial survey. Only a few acres of scattered light to moderate beech crown dieback were mapped compared to 16,000 acres in 1996. Heavy populations of the insect were associated with dieback on beech regeneration in Sherburne and were present on yellow birch saplings near larger beech trees in one Hyde Park hardwood stand. Population of the scale insect in our survey plot in Huntington changed little since 1996 and remained fairly low, following an all-time high in 1995 (Table 5, Figure 14).

Table 5. Number of oystershell scales on current year beech twigs in Camel's Hump State Forest, 1993-1997[1].

	Average Number of Mature Viable Scales per:									
	Twig					Millimeter				
	1993	1994	1995	1996	1997	1993	1994	1995	1996	1997
Suppressed	1.2	2.1	9.0	0.6	2.1	0.03	0.07	0.15	0.06	0.15
Intermediate	1.4	8.4	16.8	1.2	2.6	0.05	0.16	0.31	0.12	0.10
Codominant	4.8	3.4	11.3	0.2	4.5	0.11	0.08	0.71	0.17	0.17

[1]*Average for 10 branches from one tree per crown class, collected in Autumn, each year.*

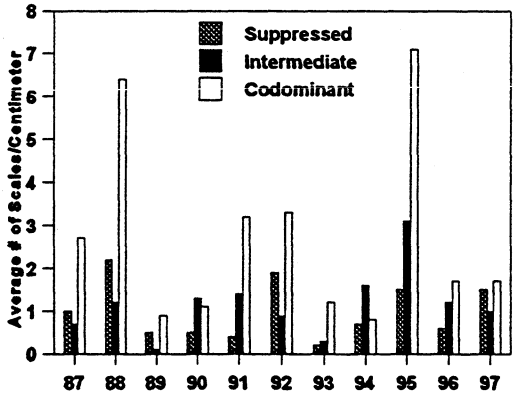


Figure 14. Oystershell scale populations in three tree canopy levels in Camel's Hump State Forest, 1987-1997. Average for 10 current year twigs/tree per crown class, collected in Autumn.

Pear Thrips, *Taeniothrips inconsequens*, populations were higher than seen in many years, but there was little damage to overstory trees and only occasional moderate damage to sugar maple regeneration and lower crown foliage. No damage was heavy enough to be aerially detected. Where damage occurred, it was related to elevation. In Stockbridge, there was moderate damage to scattered trees at 1800-2000'. Damage was also observed to apple blossoms in Putney.

Thrips emergence was unusually late, but leaf development was even later. Thrips emergence peaked the week ending on April 25 in Underhill (Figure 15). On April 29, thrips had emerged in Danby, but sugar maple buds weren't open enough for thrips to feed on them. By May 7, sugar maple buds were still closed in Landgrove. This late season bud development reduced the amount of damage.

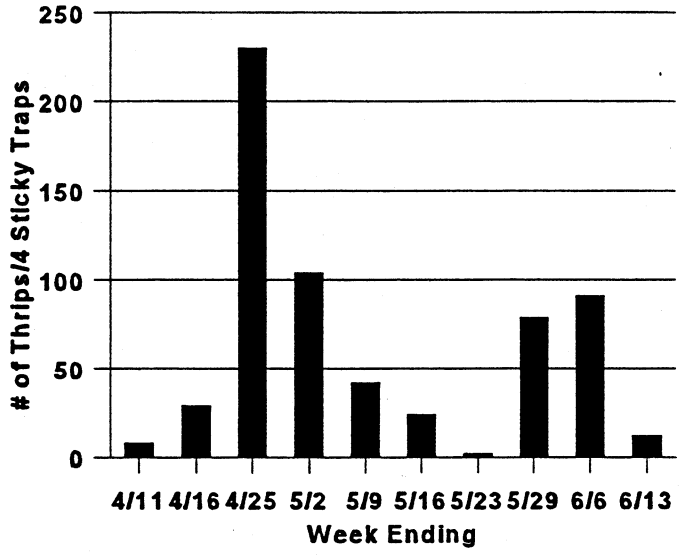


Figure 15. Total number of thrips caught in 4 sticky traps in Underhill by week in 1997.

Southern Vermont had the highest bud counts since 1988, averaging 4.7 per bud (Figure 16). In five Lamoille County locations, counts averaged about 3 per bud, and counts in Caledonia County averaged 1.6. Sticky trap counts also increased, with the highest counts since 1993. The population increase may have been due to the heavy seed year in 1996. Thrips fecundity increases when they feed on pollen.

One Landgrove location averaged 11.6 thrips per bud, including one bud with 121 thrips. Although 50% of the foliage was damaged on 5 acres, this was not visible from the air because the heaviest damage was on intermediate-suppressed poles and saplings. Soil populations in this stand have been similar to other locations with 1.4/sample in winter 1996-97 and 0.5 in winter 1997-98.

Immatures were still present on leaves on June 11; rare in some areas and common in others. Overwintering pear thrips populations in the soil remain low statewide (Figure 17).

Pine Bark Adelgid, *Pineus strobi*, remains common, but less widespread than the last few years. Populations are still heavy in some western Rutland County and Connecticut Valley locations. In the monitoring plot in Rupert, adelgid levels continue to decline, but crown density is thinner than 1996 (Figures 18-19).

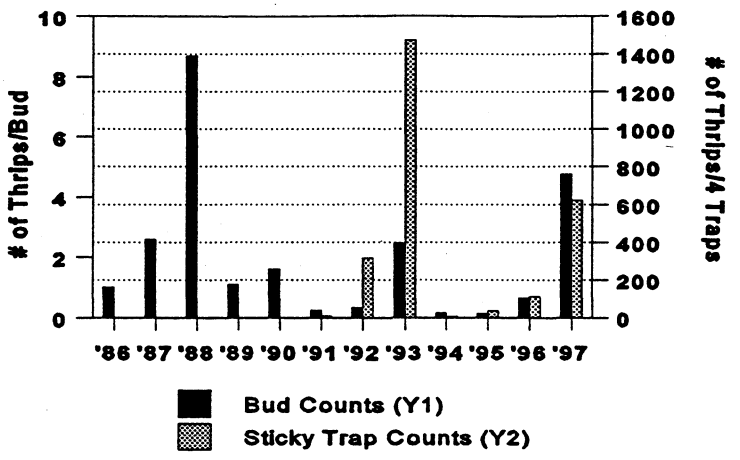


Figure 16. Spring thrips counts in buds of sugar maple in southern Vermont 1986-1997 and on sticky traps in Underhill, 1992-1997. Bud counts are an average of 2 sugarbushes in 1986, 5-6 sugarbushes in all other years (100 buds/sugarbush). Sticky trap counts are total number of thrips caught in 4 sticky traps changed weekly throughout the period of thrips emergence.

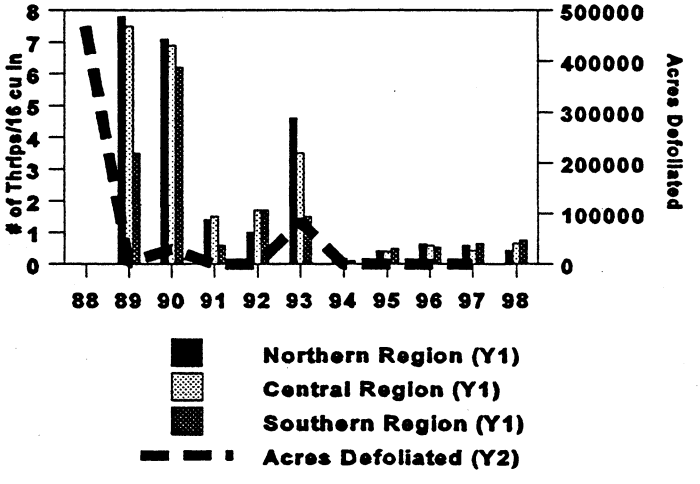


Figure 17. Average counts of overwintering pear thrips in soil samples (# of insects/16 in^3) by region of the state, compared to acres of thrips damage mapped statewide the following summer. Overwintering thrips numbers determined by extraction in 1989-93, and by forced emergence in 1994-98. 41 sites sampled in winter 1997-98.

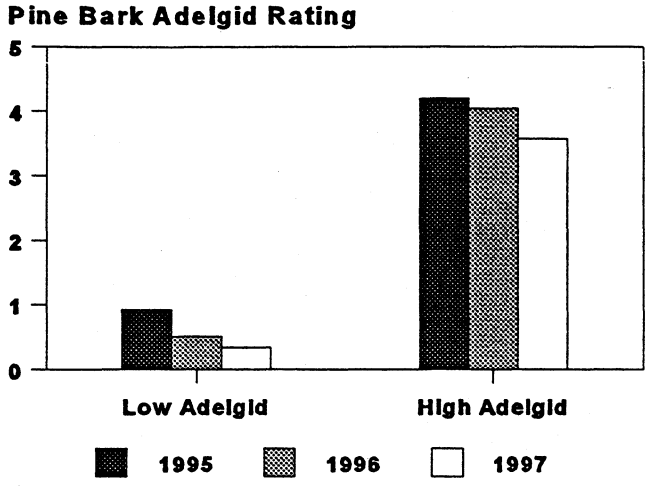


Figure 18. 1995-1997 pine bark adelgid rating on 12 white pine trees in Rupert with generally low levels of adelgid in 1995, and 23 with generally high levels. Adelgid is rated on the worst face as 0: None; 1: Some white visible; 2: Obvious white limited to one internode; 3: Obvious white more extensive; 4: More white than grey; 5: Flocculent, white over most of smooth stem.

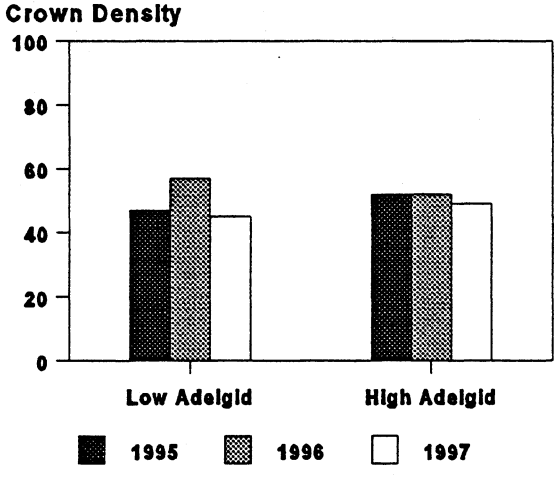


Figure 19. 1995-1997 crown density on 12 white pine trees in Rupert with generally low levels of adelgid in 1995 and 23 with generally high levels. Crown density is rated using national forest health monitoring standards.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Aphid species	Staghorn Sumac	Springfield	Causing galls on foliage.
Unknown	Catalpa	Brattleboro	Shade tree.
Aphids	Sugar Maple	Pittsford	Light populations.
Periphyllus sp.			
Aphids	Norway Spruce	Essex	
Cinara sp.			
Balsam Gall Midge			See narrative.
Paradiplosis tumifex			
Balsam Twig Aphid			See narrative.
Mindarus abietinus			
Balsam Woolly Adelgid	Balsam Fir	Hancock	Light-moderate damage.
Adelges piceae			
Beech Blight Aphid			Not observed.
Fagiphagus imbricator			
Beech Scale			See Beech Bark Disease.
Cryptococcus fagisuga			
Cooley Spruce Gall Adelgid	Douglas Fir Blue Spruce White Spruce	Widely scattered	Only light occasional to moderate damage to Christmas trees and ornamentals detected.
Adelges cooleyi			
Cottony Maple Scale	Maple	Waterbury	Ornamentals.
Pulvinaria innumerabilis			
Eastern Spruce Gall Aphid	White Spruce Red Spruce	Throughout	Common. Some moderate damage to individual trees. Good control was obtained on sprayed Christmas trees.
Adelges abietis			
Elm Cockscomb Gall (caused by aphid)	Slippery Elm	Wallingford	Single tree.
Calopha ulmicola			
Euonymus Scale	Euonymous	Colchester	Ornamentals.
Unaspis euonymi			

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Euonymus Scale *Unaspis euonymi*	Euonymous	Colchester	Ornamentals.
Fletcher Scale *Lecanium fletcheri*	Arborvitae	Brattleboro	Ornamentals.
Hemlock Woolly Adelgid *Adelges tsugae*			Not observed, including during two checks at the Stockbridge site where the insect was eradicated.
Honeylocust Plant Bug *Diaphnocoris chlorionis*	Locusts	Burlington	Ornamentals.
Lacebugs *Corythucha sp.*	Elm Balsam Poplar Sycamore	Windham, Windsor, Washington Chittenden & Lamoille Counties	Heavy damage along road-sides. Common elsewhere.
Leaf Drop Gall *(Cynipidae)*	Red Oak	Brandon	Petiole galls causing light defoliation of an ornamental in June.
Lecanium Scale *Lecanium sp.*			Not observed.
Maple Bladder Galls *Vasates quadripedes*	Silver Maple	Swanton	Single tree.
Maple Spindle Gall Mites *Vasates aceris-crumena*	Sugar Maple Red Maple	Widespread	Remains common but fewer than in 1996.
Oak Gall *(Cynipidae)*	Oak seedlings	S. Burlington	Generally of little consequence.
Oak Spangles Gall *Cecidomyia poculum*	Burr Oak		Individual tree.
Oystershell Scale *Lepidosaphes ulmi*			See narrative.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Pear Thrips *Taeniothrips inconsequens*			See narrative.
Pine Bark Adelgid *Pineus strobi*			See narrative.
Pine Fascicle Mite *Trisetacus alborum*	White Pine	Widely scattered	Light damage to scattered trees but less abundant than in 1996.
Pine Leaf Adelgid *Pineus pinifoliae*	White Pine	Widely scattered	Adults detected. No damage.
	Red Spruce	Windsor County	Shoot browning noticeable on occasional trees.
Pine Needle Midge *Contarinea baeri*	Scots Pine	Widely scattered	Moderate damage to 70 acres of Christmas trees.
Pine Needle Scale *Chionapsis pinifoliae*	Mugo Pine White Pine Scots Pine	Cambridge Windham County W. Swanton	Heavy Ornamentals.
Pine Spittlebug *Aphrophora parallela*	White Pine Eastern Larch Mugo Pine Hemlock	Widely scattered	Some heavy populations in Chittenden County, but light elsewhere.
Pine Thrips *Gnophothrips sp.*	White Pine	Tinmouth	Damage to overstory trees. No noticeable damage to Scots Pine Christmas trees for first time in several years.
Pine Tortoise Scale *Toumeyella parvicornis*	Scots Pine	Barre	On Christmas trees for the fourth consecutive year. Some dieback of lower limbs is now evident.
Poplar Petiole Gall Aphid *Pemphigus populitransversus*			Not observed.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Ragged Spruce Gall Aphid *Pineus similis*	Red Spruce	Widespread	Remains common.
Root Aphid *Prociphilus americanus*	Fraser Fir	Bennington	Young chlorotic Christmas tree.
Scale Species *Unknown*	Hemlock	Springfield	Associated with hedge shoot blight. No shootblight pathogens could be isolated.
Snowball Aphid *Neoceruraphis viburnicola*	Snowball Viburnam	Chittenden County	Less common than in 1996.
Spruce Gall Adelgid *Adelges lariciatus*			Not observed.
Spruce Spider Mite *Oligonychus ununguis*	Conifers	Throughout	Generally lighter populations than normal, perhaps due to heavy rains. No damage to firs in northern Vermont. Fall egg numbers locally high, including locations in Danby, Pittsford, Bennington, and Shaftsbury, indicating that populations may climb again in 1998.
Woolly Alder Aphid *Prociphilus tessellatus*	Alder	Stockbridge	Observed in riparian area.
Woolly Beech Aphid *Phyllaphis fagi*	Beech	Ripton Lincoln	Less noticeable elsewhere than in 1996.
Woolly Elm Aphid *Eriosoma americana*			Not observed.

BUD, SHOOT, AND STEM INSECTS

The **Asian Longhorned Beetle**, *Anoplophora glabripennis*, has not been found in Vermont. Two unconfirmed sightings in Morrisville of an insect resembling the Asian Longhorned Beetle led to much media coverage, but no actual specimens of this maple pest were ever collected. Publicity by the media and the distribution of posters with pictures of the beetle led to increased public awareness, numerous telephone calls, and beetle collections. Most specimens brought in to the Forest Biology Laboratory and to department offices were the white-spotted sawyer beetle. Four Lindgren funnel traps baited with two hexonols (E-2, Z-3) were tested in the Morrisville area for attractiveness to wood boring beetles by placing each of them in forested areas containing sugar maples. Few insects and no longhorned beetles were caught in these traps.

Balsam Shootboring Sawfly, *Pleroneura brunneicornis*, populations declined dramatically in 1997. Balsam and fraser fir plantations examined during the regular northern Vermont Christmas tree survey received only trace (149 acres) to light (29 acres) damage. For the first time in ten years, no moderate or heavy damage was detected. Populations may be depressed due to cool wet weather the past two springs. Larvae collected in 1996 were frequently diseased and overwintering survival was very poor. At a few sites surveyed this year, a preference for fraser fir seemed evident. Populations are expected to return to higher levels in 1998 but should not be too serious.

Counts of adults caught in emergence traps placed in areas of previous high populations decreased from 0.8 per square foot of soil in 1996 to 0.05 per square foot in 1997. Similarly, the number of adults caught on 3" x 5" yellow sticky cards placed in mid-crowns of heavily-damaged trees decreased from 3.1 per card in 1996 to 0.30 per card in 1997.

Adult emergence in Lamoille County during the past three years has always taken place primarily from the last week in April through the first week in May. However, the majority of adults have delayed laying eggs until maximum daily temperatures in May first exceeded 65°F and stayed warm for several consecutive days. This occurred about May 5 in 1995, May 20 in 1996, and May 29 in 1997. As a result of the extremely late egg-laying this year, the majority of successful attacks in monitored plantations were on mid-breaking frasers and very late-breaking balsams. Where fraser fir predominated, no damage appeared on the balsams. If this relationship persists, monitoring of May temperatures may be the best way to determine spray timing. This may also explain why balsam fir receives the heaviest damage in some years while fraser fir receives the heaviest damage in other years.

BUD, SHOOT, AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Allegheny Mound Ants *Formica exsectoides*	Conifers	Widespread	Killing scattered young trees, especially Christmas trees, in many locations.
Ambrosia Beetle *Scolytidae*	Birch	Chittenden	Heavy on three trees.
Asian Longhorned Beetle *Anoplophera glabripennis*			See narrative.
Balsam Fir Sawyer *Monochamus marmorator*		Wolcott	Specimen brought into the office for identification.
Balsam Shootboring Sawfly *Pleroneura brunneicornis*			See narrative.
Black Vine Weevil *Otiorhynchus sulcatus*	Yew Rhododendron	Burlington Vernon	Few weevils found associated with feeding.
Eastern Pine Shoot Borer *Eucosma gloriola*	White Pine Scots Pine	Scattered	Decreasing. Detected at one Christmas tree site this year.
European Pine Shoot Moth *Rhyacionia buoliana*			Not observed.
Gallmaking Maple Borer *Xylotrechus aceris*	Sugar Maple	Enosburg Falls	Trees broken off at point of attack.
Linden Bark Borer *Chrysoclista linneella*	Linden	Brattleboro	Ornamentals.
Locust Borer *Megacyllene robiniae*			Not observed.
Maple Petiole Borer *Caulocampus acericaulis*	Sugar Maple	Throughout	Damage fitting the description reported from widely scattered locations, but presence of insect not confirmed.

BUD, SHOOT, AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Northeastern Sawyer *Monochamus notatus*	Conifers	Statewide	Several reports and specimens in response to Asian Longhorned Beetle public awareness.
Northern Pine Weevil *Pissodes approximatus*	White Pine	Weathersfield	Ornamental.
Pales Weevil *Hylobius pales*	Balsam Fir	Bristol	Individual tree in Christmas tree plantation.
Pigeon Tremex *Tremex columba*	Sugar Maple	Walden Essex Junction Shaftsbury	Dying trees or trees cut for firewood.
Pine False Webworm *Acantholyda erythrocephala*			Not observed.
Pine Gall Weevil *Podapion gallicola*			Not observed.
Pine Root Collar Weevil *Hylobius radicis*	Scots Pine	Castleton	Dying ornamentals.
Pitch Nodule Maker *Petrova albicapitana*			Not observed.
Pitted Ambrosia Beetle *Corthylus punctatissimus*			Not observed.
Poplar Borer *Saperda calcarata*	Aspen	Florence	Associated with oozing sap.
Pseudanthonomus validus			Not observed.
Round-headedApple Tree Borer *Saperda candida*	Crabapple Mountain Ash	Rutland, Orleans, Caledonia & Chittenden Counties	Nursery and ornamentals.

BUD, SHOOT, AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Sawyer *Monochamus sp.*	Balsam Fir	Widely scattered	Light damage to Christmas trees.
Sugar Maple Borer *Glycobius speciosus*	Sugar Maple	Throughout	Associated with maple decline in a stressed stand in Royalton. Elsewhere, remains a common cause of defect on slow-growing maples.
Tree Cricket *Oecanthus nigricornis*	White Cedar	Bennington	Oviposition wounds.
Twig Pruner *Elaphidionoides villosus*	Red Oak	Addison County	Decreasing.
White Pine Weevil *Pissodes strobi*	Scots Pine Blue Spruce White Spruce White Pine Douglas Fir	Throughout	Generally heavier than normal damage to young trees. More noticeable on a broader range of Christmas tree species.
White-Spotted Sawyer *Monochamus scutellatus*	White Pine Spruces Balsam Fir	Throughout	Numerous specimens mistaken for Asian Longhorned Beetle. Collected from 6/24 to 7/21.
Zimmerman Pine Moth *Dioryctria zimmermanni*	Scots Pine Austrian Pine	Westminster Rutland Franklin St. Albans	Ornamentals.

FRUIT/NUT INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Butternut Curculio *Conotrachelus juglandis*	Butternut	Rutland Burlington	Almost every nut on some trees was weeviled.
Leaf-footed Bug *Leptoglossus corculus*	Cones	Essex Junction	Observed seeking refuge in homes in winter.

ROOT INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Asiatic Garden Beetle *Autoserica castanea*		Richford Burlington	Scattered reports and sightings.
Broad-necked Root Borer *Prionus laticollis*	Hardwoods	Essex Junction	Insect observed at large.
Conifer Swift Moth *Korsheltellus gracilis*			Not observed.
June Beetle *Phyllophaga spp.*		Caledonia & Lamoille Counties	Turf damage reported. Skunks tearing up lawns in search of grubs.

BARK INSECTS

Exotic Bark Beetles were surveyed in Christmas tree plantations between 1994 and 1997. The USDA Cooperative Agricultural Pest Survey (CAPS) targeted species for survey in the northeastern region. These included *Ips sexdentatus* (Boerner.), *I. typographus* (L.), *Orthotomicus erosus* (Wollaston), *Pityogenes chalcographus* (L.), *Hylurgops palliatus* (Gyllenhal), and *H. ligniperda* (F.). *Tomicus piniperda*, which was detected in Cleveland, Ohio in 1992, was included in some surveys as well.

Trap locations in 1994 included sites in four Vermont counties. Lindgren 8-funnel traps placed in Scots pine plantations in Orange county (town of Brookfield) and Addison county (town of Bristol) were baited with the *Tomicus piniperda* lures. These plantations had numerous fresh stumps, and the one in Bristol also had fresh Scots pine brush nearby. Traps with exotic *Ips* lure were placed in plantations of mixed spruce, fir and pine in Orleans County (town of Craftsbury) and Lamoille County (town of Wolcott).

Traps were inspected and contents collected at least once every two weeks until the third week in July. Insects collected were delivered to the Forest Biology Lab in Waterbury, were they were sorted and preserved. These first-year trap catches were sent to USDA taxonomists in Reynoldsburg, Ohio, for screening. Other than confirmation that there were no exotic species in the traps, we have no catch data for the first year of the trapping program.

Annual surveys for exotic bark beetles have continued in Vermont through 1997. Four counties were surveyed in 1995. These included Franklin (town of Bakersfield), Grand Isle (town of Grand Isle), Chittenden (town of Williston) and Addison (town of Bristol). In 1996, traps were deployed in five counties, including Bennington (town of Shaftsbury), Windsor (towns of Springfield and Sharon), Caledonia (towns of Stannard, Waterford, and N. Danville), Orange (towns of Brookfield and Newbury) and Essex (town of Lemington). Sites in 1997 included Bennington County (towns of Bennington and Shaftsbury), Windham (towns of W. Brattleboro and Dummerston), Orleans County (town of Orleans), Lamoille County (town of Waterville), and Washington County (E. Montpelier and Barre). By July 1997, all counties in Vermont had been surveyed by use of funnel traps.

No exotics were collected over the four year period. Trap data for 1995-1997 are presented here (Tables 6-9).

Table 6. Species and numbers of bark beetles and ambrosia beetles *(Gnathotrichus)* collected in Lindgren 8-funnel traps baited with Ips lure in four counties in Vermont from May 5-July 17, 1995.

Date	Location	Total	*Orthotomicus caelatus*	*Ips pini*	*Hylastes opacus*	*Gnathotrichus materiarious*	*Dryocoetes autographus*	*Dendroctonus valens*	*Ips calligraphus*
5/8/95	Franklin County, Bakersfield	4	3	1					
5/24/95		653	642	5	6				
6/7/95		394	381	3		5	2		
6/19/95		75	68	1		1	4		
6/30/95		4	4						
7/17/95		1		1					
5/8/95	Grand Isle County, Grand Isle	19	9	9	1				
5/24/95		2		2					
6/7/95		5	2	3					
7/17/95		2		1					1
5/8/95	Chittenden County, Williston	22	4	15	3				
5/24/95		15	6	6	3				
6/7/95		19	15	1	2	1			
6/19/95		0							
7/17/95		2	2		2				
5/8/95	Addison County, Bristol	35	6	28					
5/24/95		5	1	4					
	Totals	1254	1143	80	17	7	6	0	1

Table 7. 1995 Scolytid trap data.

Date	Location	Total	*Orthotomicus caelatus*	*Ips pini*	*Hylastes opacus*	*Gnathotrichus materiarius*	*Dryococetes autographus*	*Dendroctonus valens*	*Ips calligraphus*
5/8/95	Bakersfield; Franklin County	4	3	1					
5/24/95		653	642	5	6				
6/7/95		394	381	3		5	2		
6/19/95		75	68	1		1	4		
6/30/95		4	4						
7/17/95		1		1					
5/8/95	Grand Isle; Grand Isle County	19	9	9	1				
5/24/95		2		2					
6/7/95		5	2	3					
7/17/95		2		1					1
5/8/95	Williston; Chittenden County	22	4	15	3				
5/24/95		15	6	6	3				
6/7/95		7	5		2				
6/8/95		0							
6/9/95		0							
6/10/95		0							
6/11/95		0							
6/12/95									
6/13/95		0							
6/14/95		10	10						
6/15/95		1		1					
6/16/95		1				1			
6/17/95		0							
6/18/95		2		2					
6/19/95	Bristol; Addison County	35	6	28	1				
6/20/95		5	1	4					
	TOTAL	**1257**	**1141**	**82**	**16**	**7**	**6**	**0**	**1**

Table 8. 1996 Scolytid Trap Data.

Date	Location	Total	*Orthotomicus Caelatus*	*Ips pini*	*Hylastes opacus*	*Pityophthorus species*	*Ips Borealis*	*Dendroctonus valens*	*Lymantor decipens*	*Cryphalus Ruficollis*	*Hylesinus aculeatus*	*Trypodendron lineatum*	*Gnathotrichus materiarius*	*Xyloterinus politus*	*Polygraphus rufipennis*	*Pityokteines sparsus*	*Dryocoetes autographus*	*Dendroctonus punctatus*	*Phloeosinus canadensis*	*Hylurgopinus rufipes*	*Ips Grandicollis*
6/5/96	Shaftsbury; Bennington Co.	4				1					1										1
6/19/96		1																		1	
7/3/96		0																			
7/17/96		0																			
5/8/96	Springfield; Windsor Co.	7	1	5					1												
5/23/96		46	39	3	1				1		1			1							
6/5/96		0																			
6/19/96		9	8	1																	
7/3/96		6		6																	
7/17/96		1		1																	
5/8/96	Sharon; Windsor Co.	1		1																	
5/23/96		6		1	5																
6/5/96		26	1			16		8	1												
6/19/96		1			1																
5/10/95	Stannard; Caledonia Co.	1		1																	
5/22/96		31		16	13		1			1											
6/4/96		3					3														
6/21/96		7		6									1								
6/30/96		2	1	1																	
7/16/96		2		2																	
5/10/96	N. Danville; Caledonia Co.	2		2																	
5/22/96		3		1	1														1		
6/4/96		1					1														
6/21/96		2		1												1					
6/30/96		1		1																	
7/16/96		5	1	2			2														
5/23/96	Brookfield; Orange Co.	4	2	1		1															
6/5/96		1													1						
6/19/96		2	1	1																	
5/10/96	Newbury; Orange Co.	1	1																		
5/23/96		6	2	2			2														
6/6/96		2	1						1												
6/19/96		1	1																		
7/17/96		1					1														
5/10/96	Lemington; Essex Co.	2										2									
5/22/96		2		1										1							
5/22/96	Waterford; Caledonia Co.	1					1														
6/4/96		2					2														
6/21/96		2					1											1			
7/16/96		1															1				
	TOTAL	196	59	56	21	18	14	8	4	1	2	2	1	2	1	1	1	1	1	1	1

Table 9. 1997 Scolytid Trap Data

Date	Location	Total	*Orthotomicus caelatus*	*Ips pini*	*Ips borealis*	*Ips perroti*	*Polygraphus rufipennis*	*Hylesinus aculeatus*	*Pityokteines sparsus*	*Pityogenes hopkinsi*	*Dryocoetus autographus*	*Hylastes opacus*	*Gnathotrichus materiarius*	*Xyloterinus politus*	*Cryphalus ruficollis fraseri*	*Lymantor decipens*	*Tryodendron lineatrum*	*Xyleborinus saxeseni*	*Dryocoetes granicollis*	*Phloeosinus canadensis*	*Pityophthorus species*	*Crypturgus species*
5/13/97	Shaftsbury; Bennington Co.	0																				
5/26/97		1	1																			
6/10/97		0																				
6/25/97		0																				
7/6/97		0																				
7/19/97		0																				
5/13/97	Bennington; Bennington Co.	14		14																		
5/26/97		3	2	1																		
6/10/97		6	4										2									
6/25/97		22	14	7			1															
7/6/97		40	22	16															2			
7/19/97		30	14	15												1						
6/6/97	W. Brattleboro; Windham Co.	9	2	5								2										
6/23/97		1		1																		
7/7/97		0																				
7/18/97		0																				
6/6/97	Dummerston; Windham Co.	20	12					1		1	1			1		1		1			1	1
6/20/97		4	2												1	1						
7/7/97		1																				
7/18/97		0																				
5/16/97	Orleans; Orleans Co.	3		3																		
6/2/97		34	8	14	8	1					1	1								1		
6/19/97		15	1		12																1	
7/17/97		4		1	2																	
5/16/97	Waterville; Lamoille Co.	27	13	11								2					1					
5/29/97		327	304	17							1		4		1							
6/19/97		55	49		1		2		1		1		1									
7/17/97		7	7																			
5/5/97	E. Montpelier; Washington Co.	3	1	1													1					
5/30/97		19	7	5			1		2		1				2	1						
6/12/97		12	6	1	2				1		1					1						
5/5/97	Barre; Washington Co.	4		3													1					
5/30/97		14	3	11																		
6/12/97		14			14	?																
		689	472	126	39	1	4	1	4	1	6	5	7	1	4	5	3	1	2	1	2	1

OTHER BARK INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Bronze Birch Borer *Agrilus anxius*	Paper Birch	Washington & Orange Counties	Occasional damage observed.
Eastern Larch Beetle *Dendroctonus simplex*	Eastern Larch	Widespread	Remains common on larch in dieback areas.
Exotic Bark Beetles *Scolytidae*			See narrative.
Elm Bark Beetles *Hylurgopinus rufipes* *Scolytus multistriatus*			See Dutch Elm Disease.
Hemlock Borer *Melanophila fulvoguttata*	Hemlock	Springfield	Associated with wounded trees on a wet site following thinning.
Phloeosinus canadensis	Northern White Cedar	Middlebury	Newly-emerged adults feed for a short time in living twigs, killing the tips of the branches and causing flagging.
Pine Engraver *Ips pini*	White Pine	Townshend	Associated with dying pine, but not apparent cause of mortality.
Red Turpentine Beetle *Dendroctonus valens*	White Pine	Poultney	Single location.
		Townshend	Following lightening damage.
	Red Pine	Tunbridge	No recent attacks in poletimber stand damaged in 1995 and 1996.
	Scots Pine	Shaftsbury	
Spruce Beetle *Dendroctonus rufipennis*			Not observed.

INSECTS ASSOCIATED WITH DEAD AND DYING TREES

INSECT	HOST(S)	LOCALITY	REMARKS
Brachyleptura rubrica (Longhorned beetle)	Hardwoods, including Hickory, Beech, and Oak	Wells	Decaying logs.
Brown Prionid *Orthosoma brunneum* (Longhorned beetle)	Hardwoods	Essex Junction Moscow S. Burlington Lincoln Richford	Decaying logs.
Carpenter ants (red) *Camponotus ferrugineus*	Cedar and other species	St. Albans	In standing dead tree.
Carpenter bees *Xylocopa virginica*	Seasoned 2 x 4" lumber	W. Rutland	Emerged from lumber that had been brought to Vermont from Virginia.
Clytus ruricola (Longhorned beetle)	Hardwoods	Essex Junction	Adult specimen collected on flowers; larvae are are associated with hardwoods.
Divergent beech beetle *Dicerca divaricata*	Sugar Maple Other Hardwoods	Waterbury Barre Springfield	Adults sun on limbs of trees in which they breed.
Eastern Ash Bark Beetle *Hylesinus aculeatus*	Ash Firewood	Waterbury Center Strafford	Present in large numbers in homes with ash firewood.
Hololepta sp. (Hister beetle)	Butternut	Duxbury	These predacious beetles emerged from a log that was colonized by *Magdalis* weevils.
Magdalis sp. (Weevil)	Butternut	Duxbury	Emerged from decaying log.
Narceus sp. (Millipede)	Hardwoods	Duxbury	Decaying log.
Powderpost beetles Species undetermined	Cedar Shakes	Orleans	Damage occurred after wood was cut and stacked, but before it was planed.
Stictoleptura canadensis canadensis (Longhorned beetle)	At large	Calais Lincoln	Breed in dead pines, spruces, hemlock, and sometimes balsam fir.
Xylotrechus integeri (Longhorned beetle)	At large	Morrisville	Larvae feed on balsam fir and hemlock.

Forest Diseases

STEM DISEASES

Beech Bark Disease, caused by *Cryptococcus fagisuga* and *Nectria coccinea var. faaginata*, continues to cause dieback and chlorosis. About 3,200 acres were mapped. This is more than the 199 acres mapped in 1996 but less than the 9,250 acres mapped in 1995 (Figure 20, Table 7).

Tree condition remains stable in beech monitoring plots (Figure 21). Average crown dieback on living trees in northern Vermont dropped from 7.2 in 1995 to 5.5 in 1997, while average crown transparency dropped from 20.5 to 17.4. Trends in beech scale wax cover and fruiting of Nectria were variable within the plots, but elsewhere in southern Vermont, Nectria was easier to find than normal, and scale generally higher as well.

A study to relate disease incidence to bear use was initiated in cooperation with Antioch and the Vermont Department of Fish and Wildlife.

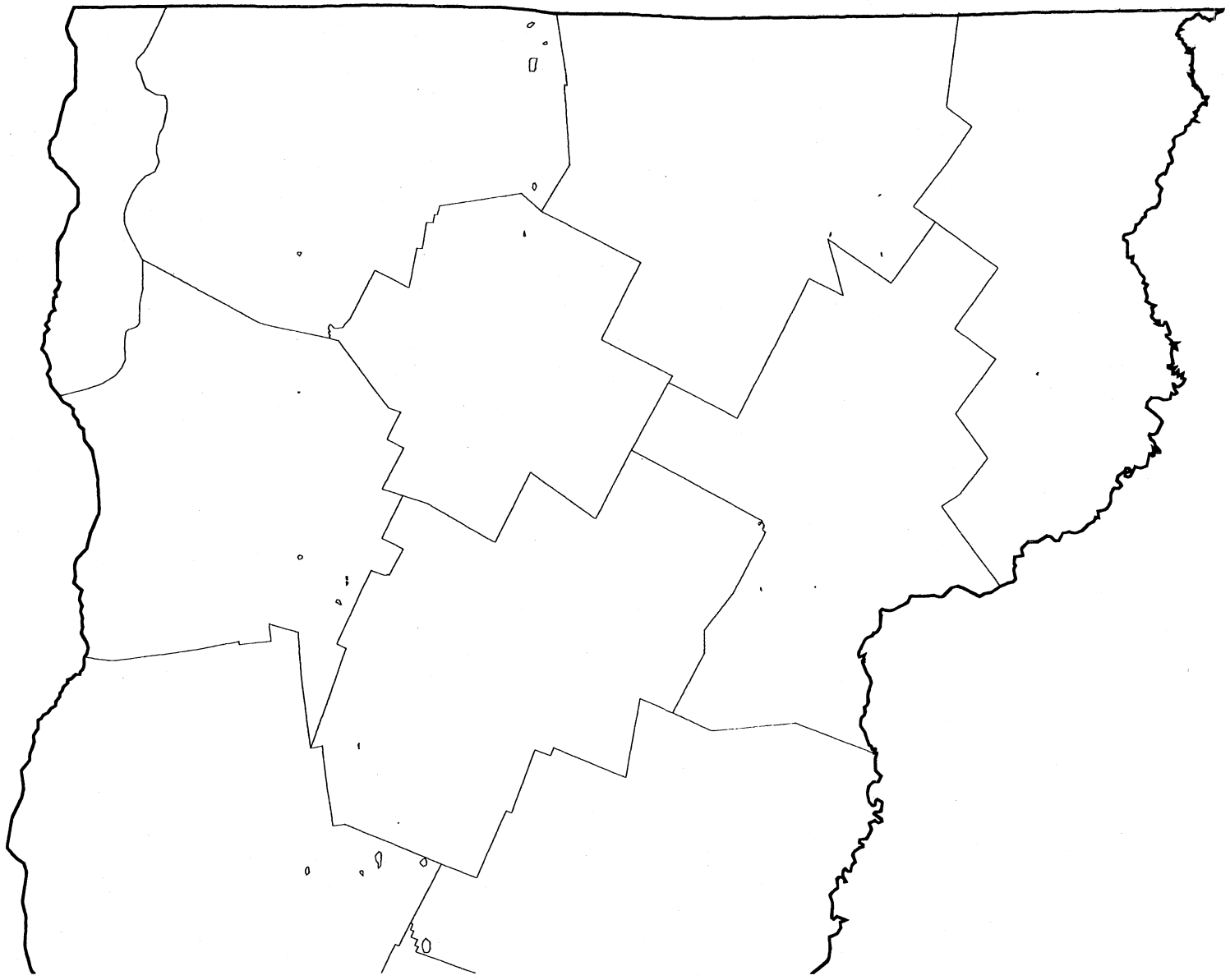
Delphinella Tip Blight of Fir caused by *Delphinella balsamae* has continued to be fairly common in northern Vermont balsam fir plantations since first reported in 1994. In 1997, the disease was detected in five locations in Washington and Lamoille counties during the Christmas tree survey. Delphinella has been detected every year in two of these plantations, one in Montpelier and one in Wolcott. Both plantations are bordered by tall, native fir trees and had moderate to heavy infection this year.

This disease really blossomed in the Wolcott plantation this year, causing some trees to look fire-scorched in early summer. Infection was also observed throughout the entire crown of native balsams of all sizes in the adjacent woods. Spray trials were conducted on one block of trees. The grower applied Clearys Protect T/O fungicide, plus sticker, by mistblower. One application was made about a week after budbreak, with a second application 10 days later. This provided excellent protection from the disease. Treated trees averaged only 3% needle loss while untreated trees averaged 37% needle loss.

Diplodia (Sphaeropsis) Tip Blight caused by *Sphaeropsis sapinea*, caused widespread scattered shoot mortality of pine and fir throughout the Christmas tree survey area again this year. Frequency of the disease was similar to that seen in 1996, but infection was generally light. The tip blight was detected in 36 percent of the fir plantations and 47 percent of the pine plantations surveyed. Elsewhere, infections brought on by the 1995 drought continued to be observed. In one red pine plantation in Springfield, the rotation age was shortened due to Diplodia; the stand will be regenerated.

Scleroderris Canker, caused by *Ascocalyx abietina*, has not been found in any new towns since 1986. A total of 17 pine Christmas tree plantations within the quarantine zone (Figure 22), were surveyed for the presence of the disease this year and all were found free of the disease.

BEECH BARK DISEASE



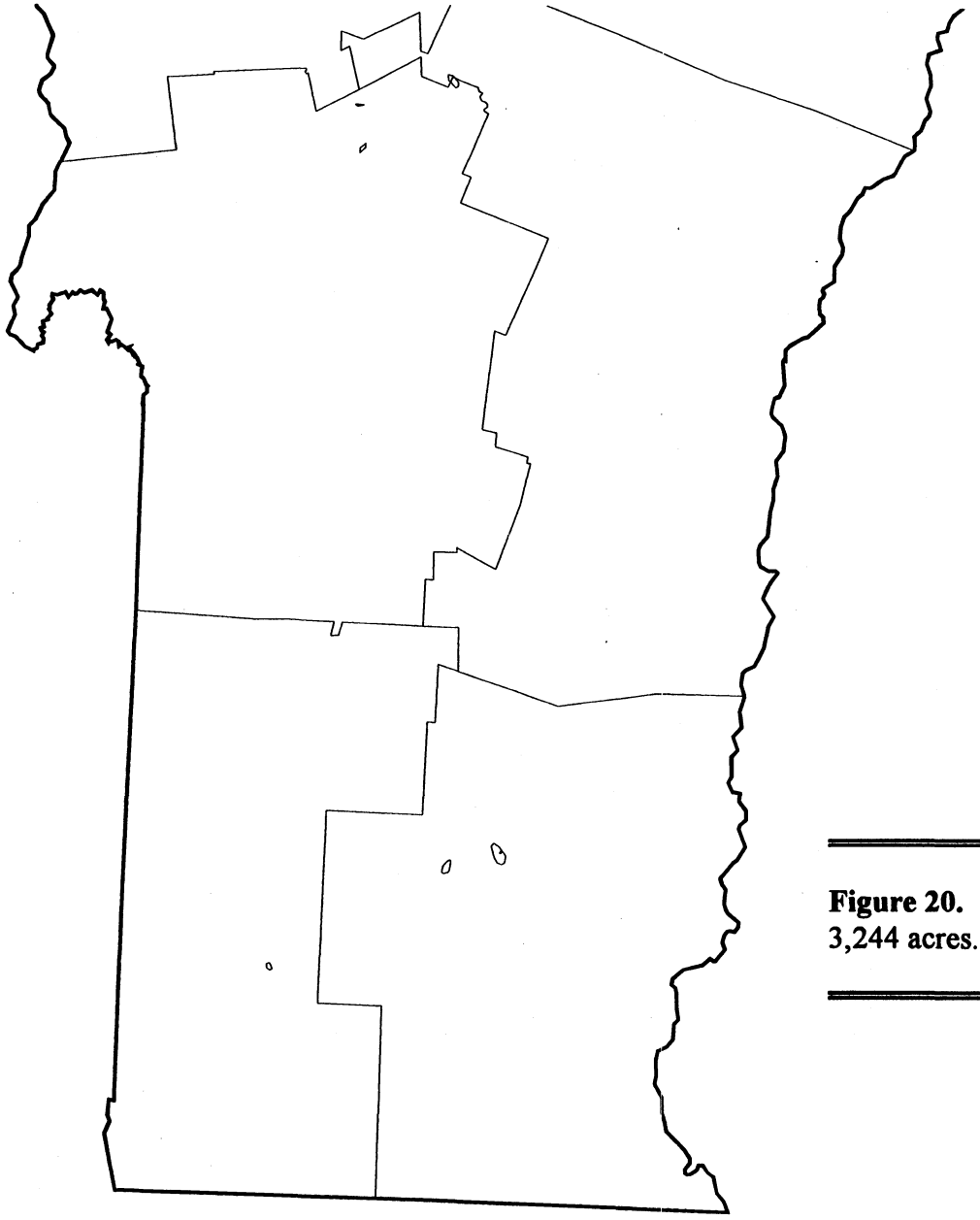


Figure 20. 1997 Beech bark disease. Mapped area is 3,244 acres.

Table 7. Acres of beech bark disease mapped in 1997.

County	Total
Addison	612
Bennington	88
Caledonia	18
Chittenden	231
Essex	24
Franklin	637
Lamoille	35
Orange	371
Orleans	53
Rutland	256
Washington	28
Windham	818
Windsor	73
Total	**3,244**

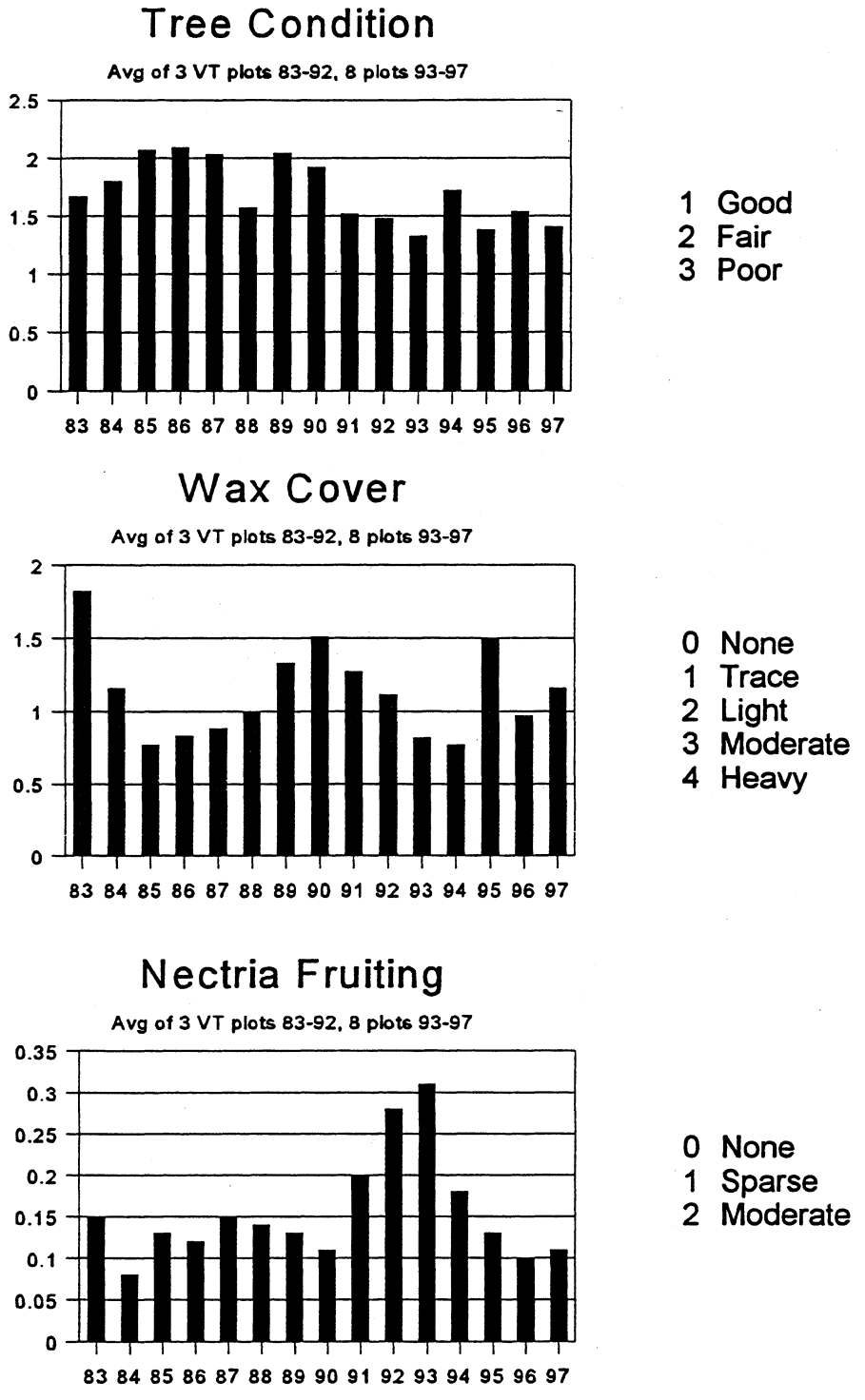


Figure 21. Average live tree condition, beech scale wax cover, and Nectria fruiting ratings 1982-1997. Average of three southern Vermont locations, 1983-1992, and six to eight locations statewide, 1993-1997.

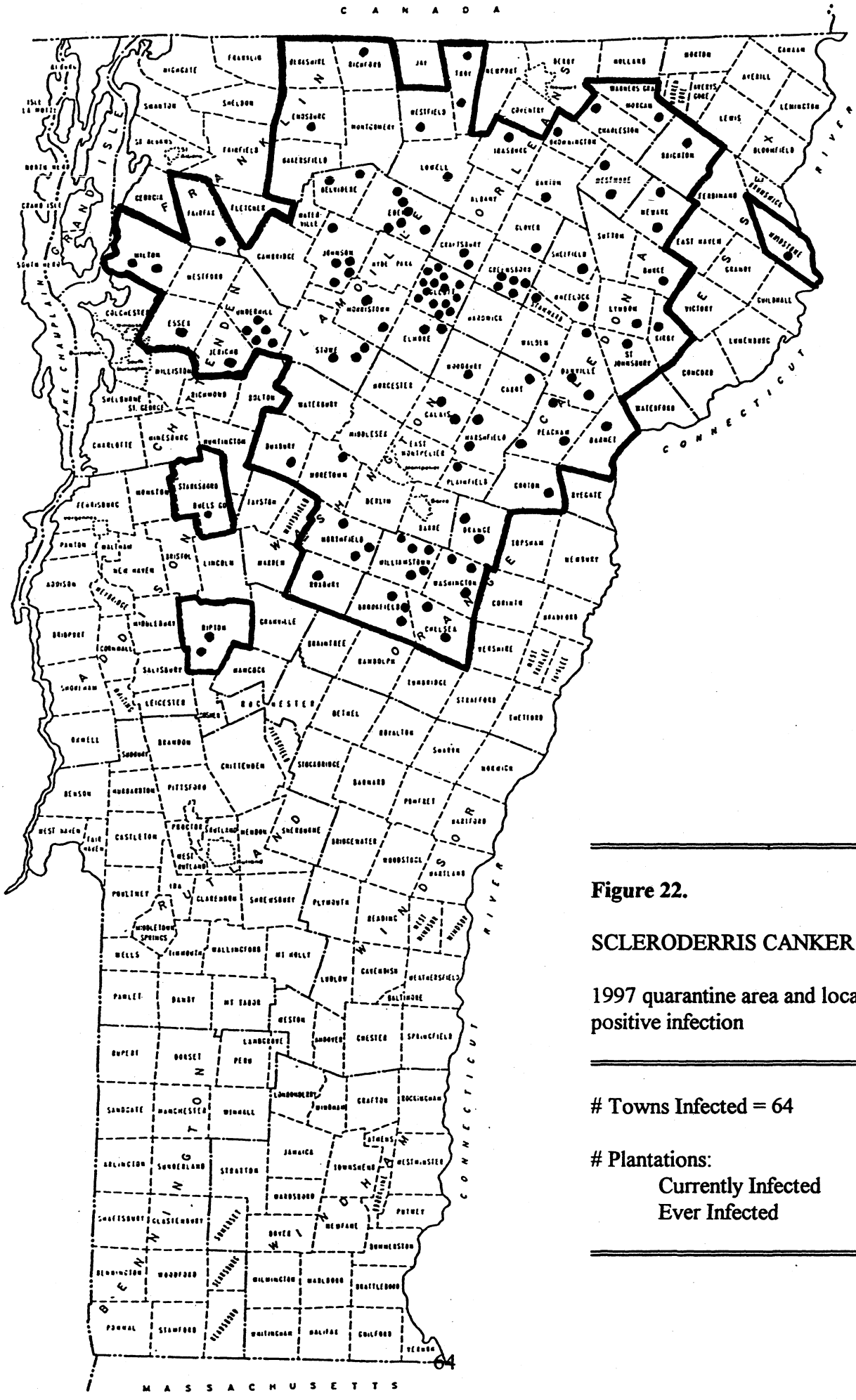


Figure 22.

SCLERODERRIS CANKER

1997 quarantine area and location of positive infection

Towns Infected = 64

Plantations:

Currently Infected	= 126
Ever Infected	= 130

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annual Canker *Fusarium sp.*	Sugar Maple	Montpelier	Fewer than in the past on stressed State House ornamentals.
Ash Yellows *Mycoplasma-like organism*	White Ash	Throughout	Stable.
Beech Bark Disease *Cryptococcus fagisuga* and *Nectria coccinea var. faginata*			See narrative.
Black Canker *Glomerella miyabeana*	Stream Coe Willow Willow sp.	Hyde Park	Causing dieback and mortality of ornamentals in two locations.
Black Knot *Dibotryon morbosom*	Cherry	Throughout	Remains common.
Bluestain *Leptographium sp.* *Verticicladiella sp.*	White Pine	Townshend	Associated with pocket of mortality in sawtimber stand.
Boxelder Shoot Blight *Unknown*	Boxelder	Southern Vermont	Shoot blight most visible in spring on 1996 shoots. Cytospora-like fungus and a Fusarium isolated from dying shoots. Cytospora and Sphaeropsis fruiting bodies on dead twigs.
Butternut Canker *Sirococcus clavigignenta-juglandacearum*	Butternut	Throughout Hancock	Remains a common cause of mortality. Trees without cankers occasionally observed in heavily-infected stands. 30% of grafts successful at a resistant tree planting at GMNF site.
Caliciopsis Canker *Caliciopsis pinea*	White Pine	Throughout	Less prevalent than in past years. Stands with past infection generally looking good. Some crown thinning.
Chestnut Blight *Cryphonectria parasitica*	Chestnut	Stockbridge Brattleboro	Large trees which had escaped are now cankered.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Cytospora Canker *Leucostoma kunzei*	Blue Spruce	Rutland Mendon	New observations on ornamentals.
Delphinella Tip Blight of Fir *Delphinella balsamae*			See narrative.
Diplodia Shoot Blight *Diplodia pinea (Sphaeropsis sapinea)*			See narrative.
Dutch Elm Disease *Ceratocystis ulmi*	American Elm	Throughout	Generally appears stable, but reported to be heavier than normal in Bennington County. Mortality of young roadside elms common.
Eastern Dwarf Mistletoe *Arceuthobium pusillum*			Not observed.
Fireblight *Erwinia amylovora*	Flowering Crabapple Apple	Woodstock, Montpelier, & Caledonia County	More calls than in 1996 in northeastern Vermont.
Hypoxylon Canker *Hypoxylon pruinatum*	Poplar	Throughout	Breakage at cankers widespread following winter 1996-97 snowstorms.
Kabatina Blight *Kabatina juniperi*	Red Cedar	Castleton Hubbardton	Common on roadside trees.
Leucostoma Canker *Leucostoma sp.*	Snowdrift Crabapple	Essex Junction	Ornamental.
Maple Canker *Steganosporium ovatum*	Sugar Maple Red Maple	Essex & Caledonia Counties	On ornamentals. More common on red than sugar maple this year.
Oak Wilt *Ceratocystis fagacearum*			No suspects observed during aerial surveys.
Phomopsis Twig Blight *Phomopsis sp.*	Eastern Red Cedar	Addison & Bennington Counties	Fewer calls this year.
Pine Wood Nematode *Aphelenchus sp.*	White Pine	Townshend	In inner bark from upper crown of dying pines in sawtimber stand.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Red Ring Rot *Phellinus pini*	White Pine	Royalton	On trees in a stand with many small crowns and wounding.
		Lyndon	Plantation.
Sapstreak *Ceratocystis coerulescens*	Sugar Maple	Shaftsbury	Shallow rooted trees on rocky microsites in a sugarbush.
		Rochester Mt. Holly	Scattered mortality in managed stands.
Scleroderris Canker *Asocalyx abietina*			See narrative.
Sirococcus Shoot Blight *Sirococcus strobilinus*	Red Pine Blue Spruce White Spruce	Peacham Scattered	Increase over 1996 levels in Groton State Forest. Light decreasing damage on Christmas trees in most locations. Severe damage in one blue spruce plantation in Johnson that had been left unmanaged for many years.
Stem Canker Species undetermined	Dogwood	Ferrisburg	Ornamentals.
Verticillium Wilt *Verticillium albo-atrum* or *V. dahliae*	Sugar Maple	Danville	One ornamental with light dieback.
White Pine Blister Rust *Cronartium ribicola*	White Pine	Throughout	Appears stable to slightly increasing. Scattered light mortality. Found in 80% of the white pine Christmas tree acres surveyed.
Woodgate Gall Rust *Endocronartium harknessii*	Scots Pine	Throughout	Decreasing. Present in 60% of Scots pine Christmas tree acres surveyed.
Yellow Witches Broom Rust *Melampsorella caryophyllacearum*	Balsam Fir	Throughout	Remains common.

FOLIAGE DISEASES

Anthracnose was observed on a variety of hardwoods. **Paper Birch Anthracnose**, caused by *Marssonina betulae*, was much less noticeable than in 1996. It was observed in scattered Northeast Kingdom locations, but was not heavy enough to be aerially mapped. **Maple Anthracnose**, caused principally by *Gloeosporium* and *Apiognomonia* species was fairly common this year but incidence was way down from 1996 levels. Fifty acres of scattered light damage was mapped in Caledonia County during aerial survey. More damage was seen on red maple than sugar maple during shade tree visits this year. **Oak Anthracnose**, caused by *Apiognomonia quercina*, and **Sycamore Anthracnose**, caused by *Apiognomonia venata*, were widely scattered in southern Vermont due to early moist conditions.

Poplar Leaf Blight, caused by *Marssonnia* species, caused widespread damage to balsam poplar again this year, but unlike 1996, quaking aspen had little damage.

Rhizosphaera Needle Disease of Fir, caused by *Rhizosphaera pini*, first found to be causing serious needle loss in 1996 in a Danville plantation, was much more widespread in 1997 than in 1996. It was detected in three new locations during the regular Christmas tree survey but may have been missed in plantations visited early in the summer since symptoms don't peak until late summer. In late October, an additional 21 plantations in Lamoille, Washington, Orleans, and Caledonia counties were visited, either at the request of concerned growers or as a spot check. The disease was present in 15 (71%) of these plantations and in all four counties. Plantations in Addison, Windsor, and Windham counties also had the disease present.

Damage was light in most locations, but damage was heavy enough to make some trees unsaleable in 5 of the 20 plantations known to be infected. Damage was restricted to balsam fir except for light damage to frasers adjacent to infected balsams. Look for brown needles of normal size especially on current and last year's shoots, with some needles hanging straight down.

The disease was also present in wild balsam fir trees of all sizes in all four northern counties as well as Windsor and Windham counties. Fruiting bodies were easily found on understory foliage. In one plantation of overgrown pole-sized fir, diseased needles were seen throughout tree crowns. Wherever wild or plantation balsam were infected with Delphinella Tip Blight, there was usually some Rhizosphaera present as well, but the opposite was not true.

Spray trials were conducted by a grower in Danville using Cleary Protect T/O and Bravo 500. Materials were applied with a back pack hydraulic sprayer after initial budbreak and again 1 week and 3 weeks later. Both materials significantly reduced needle browning on current growth but damage was still very noticeable on some treated trees. Dead attached needles from the previous year contributed to tree appearance. Also, it is unknown how often infection takes place, making spray timing a calculated guess until more is known about this fungus. For trees with rows running east-west, needle infection was greatest in these directions, particularly where branches overlapped with those of adjacent trees. Infection was at least 3 times lighter on the more open south sides of the trees where better drying conditions occurred.

Since this fungus is widely distributed, it could become a major problem in fir plantations if weather continues to be favorable to increased infection. Cultural methods to improve air drainage are probably the best approach to reducing future damage, since heaviest damage occurs in cold pockets and where trees are crowded or partially shaded. Good weed control, reducing tree crowding, basal pruning, and removing trees that are shading plantation trees are all measures that should reduce damage.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose *Gloeosporium spp.*			See narrative.
Apple Scab *Venturia inaequalis*	Apple	Throughout	Dramatically down everywhere except Northeast Kingdom.
Balsam Fir Needlecast *Lirula nervata*	Balsam Fir	Weston Cabot	Cleary's Protect applied to one Christmas tree plantation. By fall, no Lirula symptoms on sprayed or unsprayed trees.
Balsam Needlecast *Unknown*	Balsam Fir	Rutland Bennington	Some yellowing and needlecast of current foliage on Christmas trees. Symptoms of edema on needles.
Brown Spot Needle Blight *Scirrhia acicola*			Not observed.
Cedar-Apple Rust *Gymnosporangium juniperi-virginianae*	Crabapple Eastern Red Cedar Cedar	Springfield Addison County North Hero	Ornamentals. Stable. Heavy load on scattered trees.
Coccomyces Leaf Spot *Blumeriella jaapii*	Black Cherry	Widely Scattered	Light damage this year. Down some.
Cyclaneusma Needlecast (formerly Naemacylcus) *Cyclaneusma minus*	Scots Pine	Throughout	Remains common.
Dothistroma Needlecast *Dothistroma pini*	Austrian Pine	Craftsbury	
Exobasidium Gall *Exobasidium vaccinii*	Azalea	Brattleboro	Single azalea affected.
Fir-Fern Rust *Uredinopsis mirabilis*	Balsam Fir	Widespread	Mostly very light damage this year. Similar to 1996.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Giant Tar Spot *Rhytisma sp.*	Norway Spruce	Springfield Guilford	Ornamental and roadside trees.
Lophodermium Needlecast *Lophodermium seditiosum*	Scots Pine	Throughout	Light to moderate damage on most of the Scots Pine Christmas tree acres surveyed. Also observed causing moderate damage in Townshend and Castleton.
Melampsora Rust *Melampsora abietis-canadensis*	Hemlock	Rupert	Ornamental.
Needlecast *Bifusella linearis*	Eastern White Pine	Barre	In Christmas tree plantation.
Oak Leaf Blister *Taphrina deformans*	Red Oak	Bennington Shaftsbury	Isolated cases.
Phyllosticta Leafspot *Phyllosticta sp.*	Concolor Fir	Rutland	Damage more severe in upper crown of 2-3' trees.
Poplar Leaf Blight *Marssonina spp.*			See narrative.
Powdery Mildew *Erysiphe* or *Microsphaera*	Lilacs Flowers	Essex, Orleans, & Caledonia Counties	Common in NE Kingdom. Not observed elsewhere this year. Down from 1996.
Rhabdocline Needlecast *Rhabdocline pseudotsugae*	Douglas Fir	Widespread	Light to moderate damage seen in all the Douglas Fir Christmas tree plantations surveyed.
Rhizosphaera Needlecast *Rhizosphaera kalkhoffi*	Blue Spruce White Spruce	Throughout	Mostly light damage on 50% of spruce Christmas tree acres surveyed. Also common on ornamentals. Stable.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Rhizosphaera Needlecast of Fir *Rhizosphaera pini*			See narrative.
Swiss Needlecast *Phaeocryptopus gaumanni*	Douglas Fir	Widespread	Moderate to heavy damage to Christmas trees, in Townshend and Rutland, on foliage infected in moist spring of 1996. Light to moderate damage seen in all northern Vermont Douglas Fir Christmas tree plantations surveyed.
Tar Spot *Rhytisma punctatum*	Sugar Maple Red Maple	Widely Scattered	Mostly trace damage. Down from 1996.
Venturia Leaf Blight *Venturia acerina*	Sugar Maple	Middlebury	
White Pine Needle Blight *Canavirgella banfieldii*	White Pine	Widespread	Heaviest damage seen in many years.
Willow Scab *Venturia saliciperda*	Willow	Rutland & Windsor Counties	Scab from '95 wet conditions causing dieback.

ROOT DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annosus Root Rot *Heterobasidion annosum*			Not observed.
Crown Rot *Phytophthora sp.*	Balsam Fir	Lincoln	Causing mortality.
Shoestring Root Rot *Armillaria spp.*	Fraser Fir	Bennington	Associated with pockets of mortality in a Christmas tree plantation. Diseased trees had pitch at root collar. Approximately 100 trees dead over a 12-month period. Phytophthora could not be isolated, although soil was somewhat heavy.
	Many	Throughout	Mushrooms unusually abundant.
	Red Spruce	Green Mountains	Red spruce regeneration healthy in decadent deer wintering areas.
	Hemlock	Springfield	Associated with mortality following thinning.
	Balsam Fir	Putney Cabot	Christmas tree mortality near plantation edge or hardwood stumps.
Tomentosus Root Rot *Polyporus tomentosus*			Not observed.

Ash Dieback remains common, but none was mapped from the air. Crown density remains stable in the Woodstock monitoring plot established to follow the health of trees impacted by a heavy seed crop in 1993 (Figure 23). The crowns which had heavy dieback related to seed production continued to be thinner than those which did not. The trees are not producing foliage to fill in the lower and inside crown area affected in 1993. This plot will not be reevaluated.

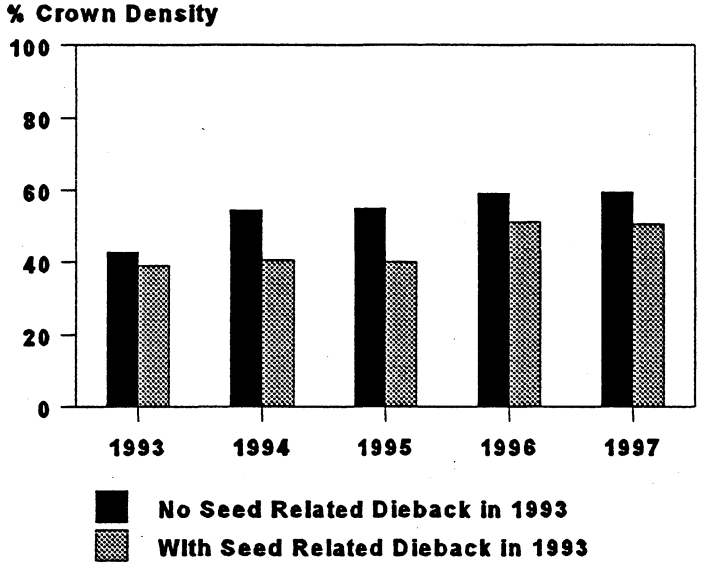


Figure 23. Average crown density 1993-1997. Ten white ash that had dieback related to seed production in 1993 are compared to 9 original trees 1993-1995, and 8 survivors in 1996-1997, that did not have dieback related to seed.

Autumn Shedding and discoloration of older conifer needles, a natural occurrence, was much more extensive and noticeable on northern Vermont Christmas trees this year than most years, and resulted in numerous calls from concerned growers. Every once in a while, in response to environmental conditions, a year comes along when the old yellow to brown needles are very obvious in October, and this was one of those years.

Birch Decline continues to be mapped during aerial surveys, particularly at upper elevations, but the areas affected are scattered and do not appear to be increasing. About 300 acres were mapped, mostly in Essex County, compared to 500 acres in 1996, and 650 in 1995. Reports of birch decline were especially common early in the summer, when moisture was less available.

Tree health in plots established to monitor the impact of late season birch defoliation and other stressors was evaluated in 1997 (Figure 24). The plots have been monitored for four years. There has been no significant change in the percent of paper birch or white birch trees which are healthy.

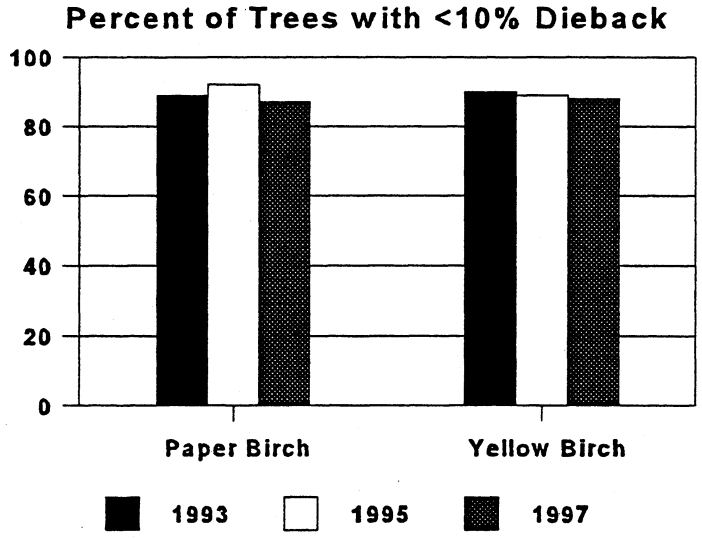


Figure 24. Average percent of live birch trees (≥ 5" DBH) with ≤ 10% dieback in 9 birch monitoring plots 1993-1997.

Browning and Defoliation of Ash and Other Hardwoods was observed on over 450 acres in over twenty locations in southern Vermont (Figure 25, Table 8). The cause is unknown. Most areas were less than 10 acres, although they ranged in size from 3-100 acres. This premature defoliation may have been responsible for some of the additional 17,000 acres that were mapped as having thin crowns on hardwoods.

Symptoms observed included thin canopy, browning, and casting of leaves. Symptomatic areas appeared as discrete pockets, often on northeastern aspects, along ridge lines, or on hill tops (Figure 26). Some, but not all, affected sites were ledgy. Symptoms were most severe on overstory trees, but were also observed on smaller trees, shrubs, and herbaceous plants. Although white ash was most severely affected, there were similar symptoms on white birch, beech, sugar maple, striped maple, red oak and ironwood. Some understory red spruce showed needle cast on current year's growth. A few woody seedlings and patches of fern, in some areas, were dead.

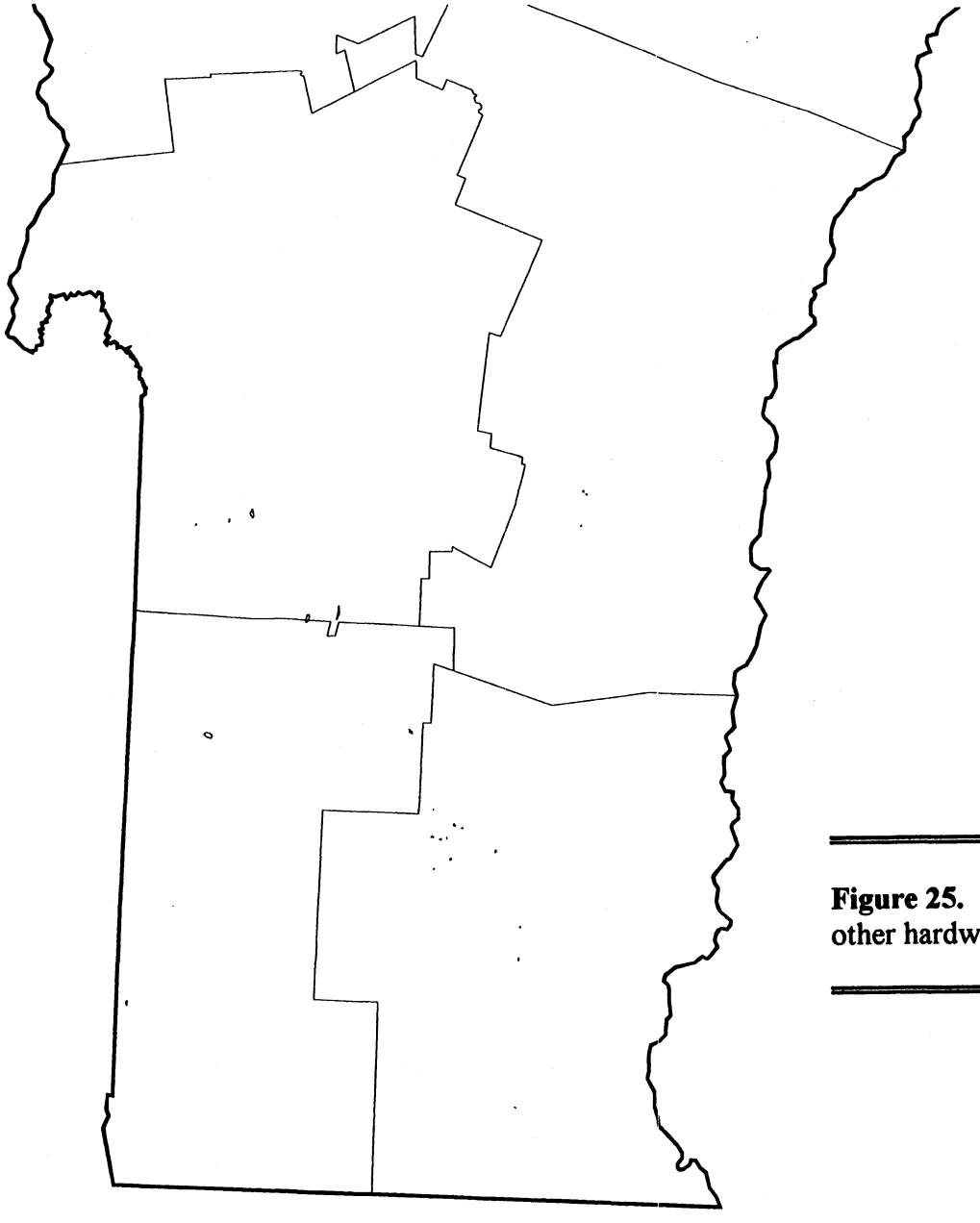


Figure 25. 1997 Browning and defoliation of ash and other hardwoods. Mapped area is 467 acres.

Table 8. Mapped acres of browning and defoliation of ash and other hardwoods in 1997.

County	Acres
Bennington	159
Rutland	199
Windham	91
Windsor	18
Total	**467**

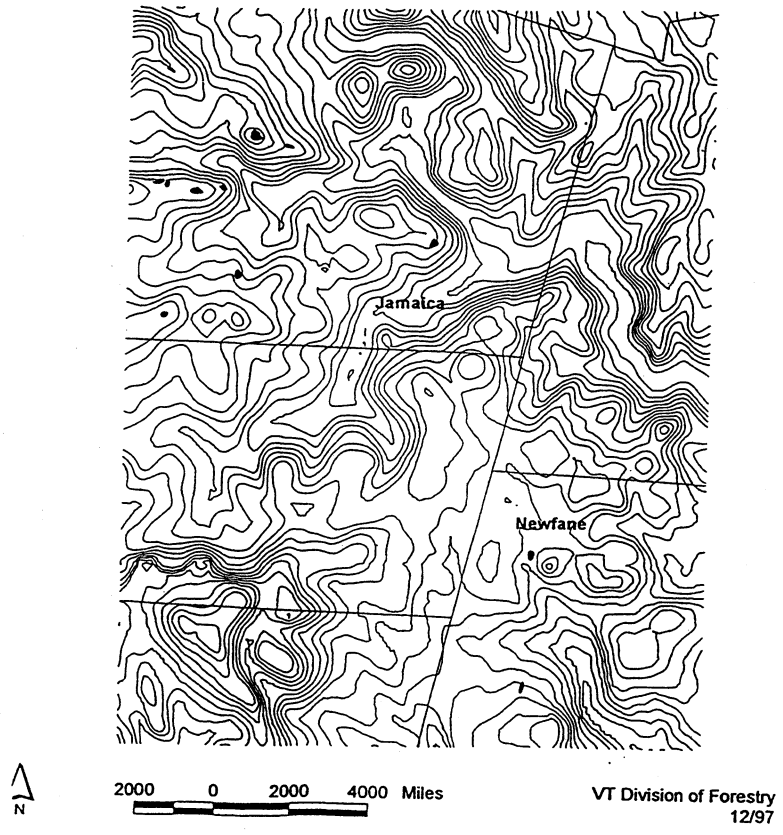


Figure 26. Location of mapped areas of browning and defoliation of ash and other hardwoods in part of Windham County, showing locations relative to topography.

No causal agents were detected on the ground. The areas were mostly remote, and had not been recently logged or influenced by other human activity. Samples of symptomatic tissues were taken to the UVM Forest Pathology laboratory for microscopic examination and culture, but no causal agents were identified from any of these samples.

Similar symptoms were observed in 1997 in the mountains of Virginia, and in western Massachusetts.

Hardwood Decline and Mortality increased somewhat, with 26,256 acres of thin crowns, chlorosis, dieback or off-color foliage mapped during the aerial survey, compared to 10,440 mapped in 1996 (Figure 28, Table 9). Two consecutive years with adequate moisture during most of the growing season have led to generally healthy foliage, and recovery of trees under minor stress.

In general, more hardwood symptoms are mapped in years where growing season precipitation is below average (Figure 27). The exception was in 1993, when over 50,000 acres with both thrips damage and hardwood decline symptoms were mapped.

Table 9. Mapped acres of hardwood decline and mortality in 1997.

County	Total Acres
Addison	1,725
Bennington	14,171
Chittenden	495
Franklin	400
Grand Isle	17
Lamoille	1,117
Orleans	738
Rutland	1,400
Washington	1,083
Windham	4,864
Windsor	246
Total	**26,256**

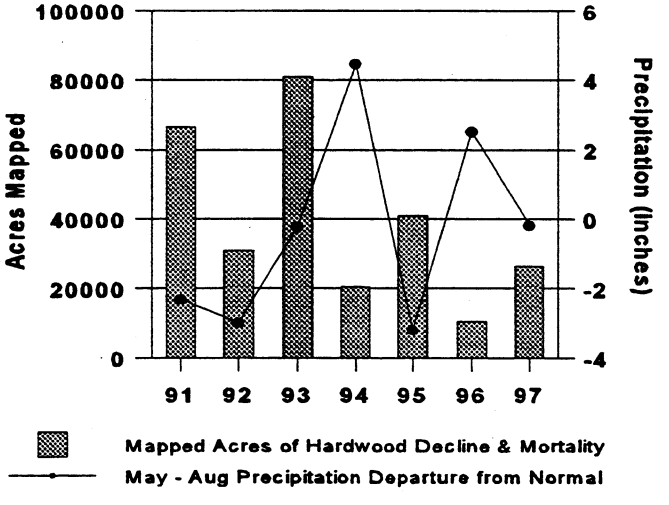
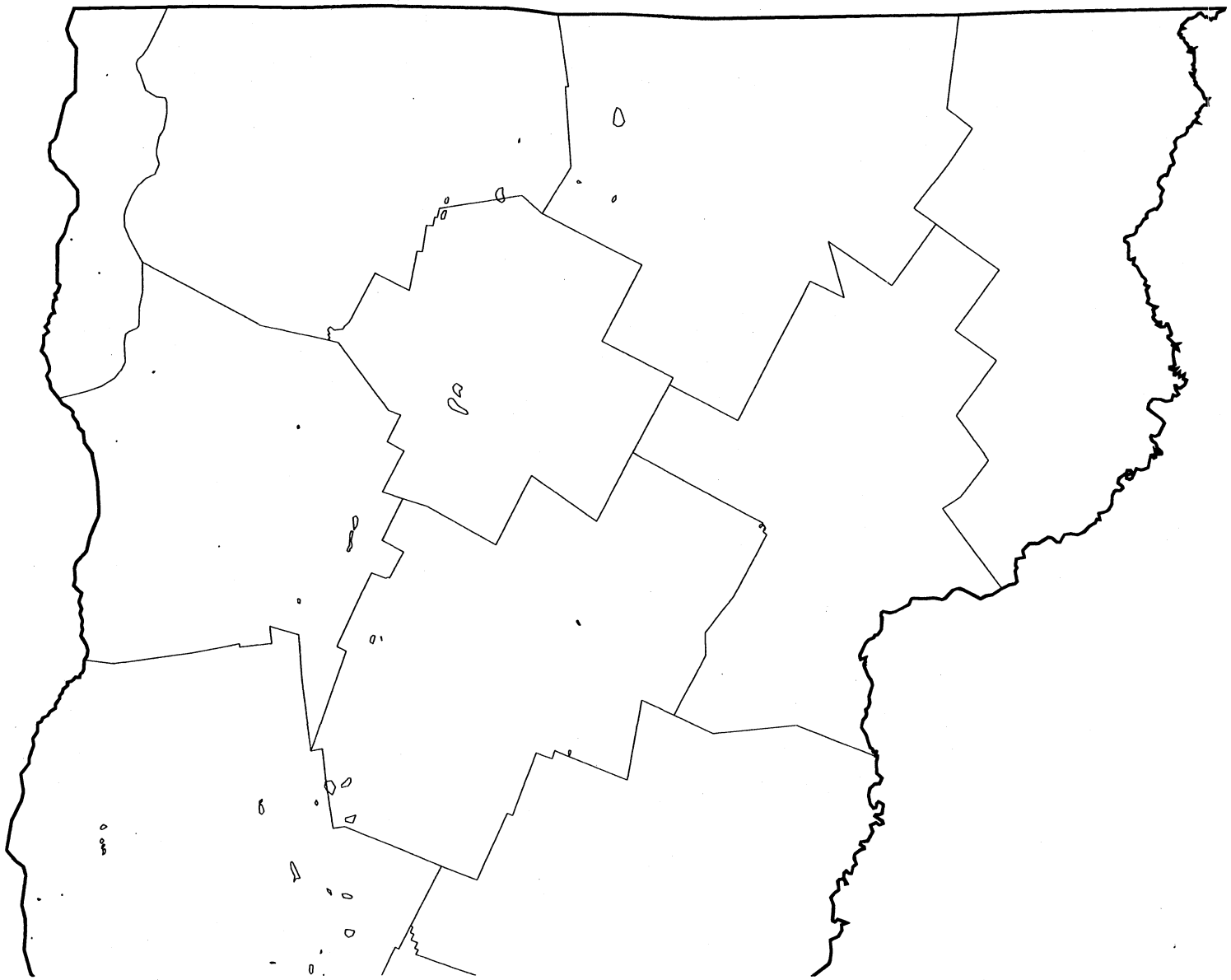


Figure 27. Acres of hardwood decline and mortality symptoms mapped statewide, by year, and growing season (May-August) precipitation departure from normal, 1991-1997.

HARDWOOD CHLOROSIS, EARLY COLOR, THIN CROWNS, DIEBACK and MORTALITY



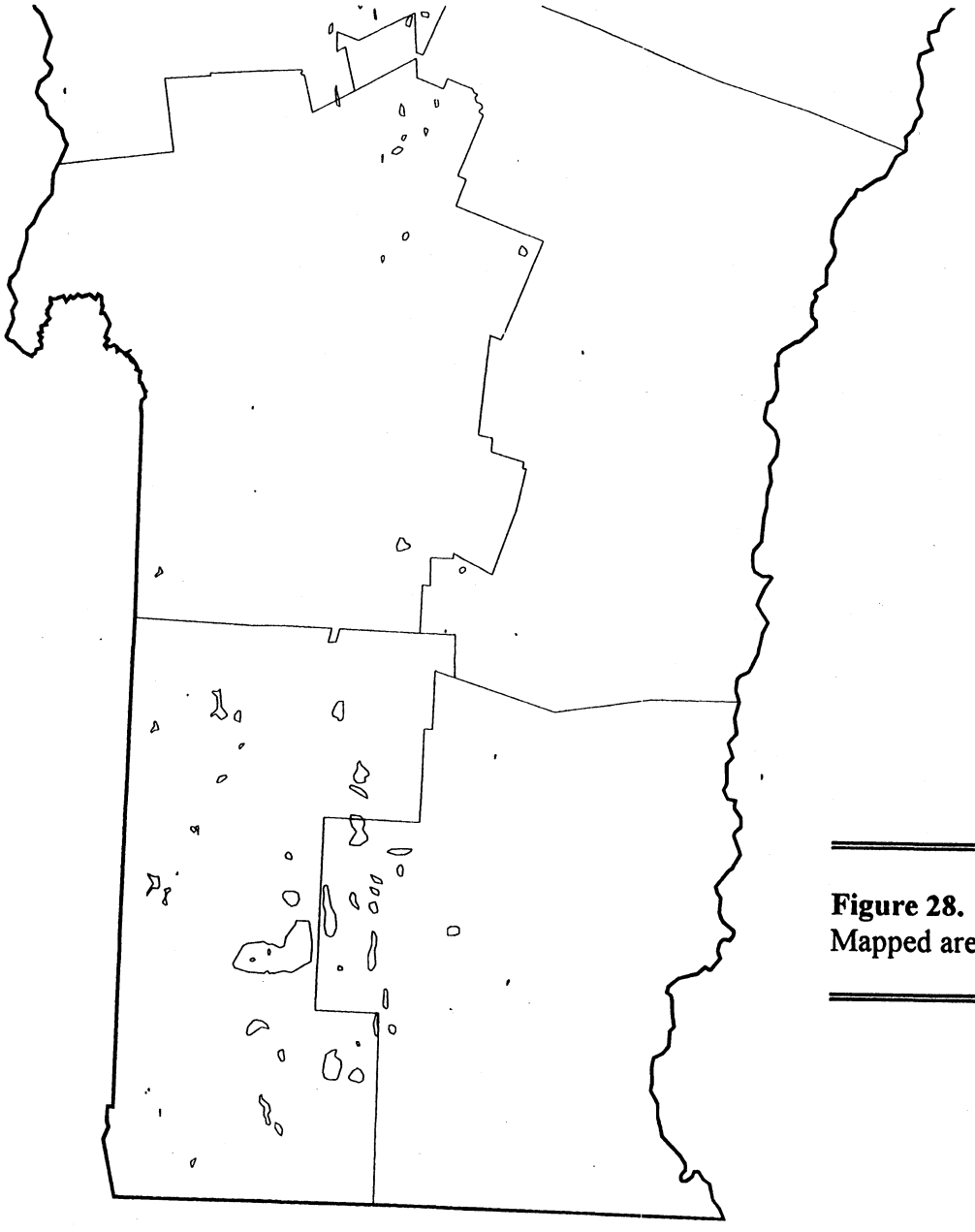


Figure 28. 1997 Hardwood decline and mortality. Mapped area is 26,256 acres.

Spruce Mortality and Dieback, primarily of upper elevation red spruce, combined with some balsam fir, was mapped on 1,805 acres, compared to 3,670 acres in 1996, and 1,710 acres in 1995 (Figure 29, Table 10).

Table 10. Mapped acres of spruce mortality and dieback.

County	Total Acres
Addison	44
Bennington	638
Chittenden	120
Essex	254
Franklin	78
Orleans	352
Rutland	67
Washington	219
Windsor	33
Total	**1,805**

Wet Site Dieback and Mortality continues in perennially flooded sites. The acres affected are fairly stable, with 10,297 acres mapped, similar to the 9,400 acres mapped in 1996, and 10,700 acres mapped in 1995 (Figure 30, Table 11).

Table 11. Mapped acres of wet site dieback and mortality in 1997.

County	Total Acres
Addison	3,189
Bennington	7
Chittenden	898
Franklin	2,324
Grand Isle	2,503
Lamoille	15
Orleans	11
Rutland	1,270
Washington	38
Windham	38
Windsor	4
Total	**10,297**

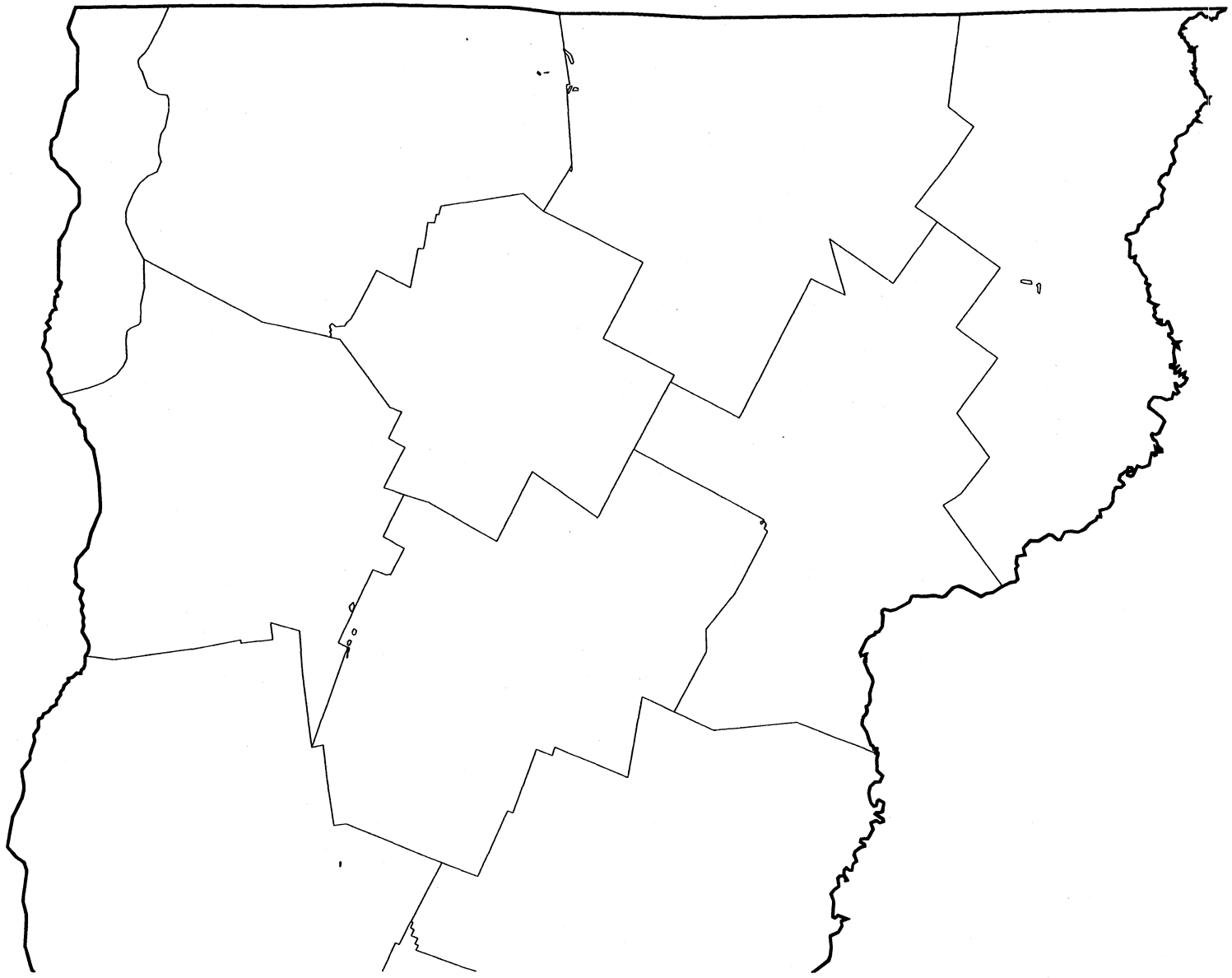
Wet site conditions were also responsible for fraser fir Christmas tree mortality in a Montpelier plantation, and mortality following thinning in a hemlock stand in Springfield.

Winter Injury of Red Spruce was mapped on 260 acres in Bennington County (Figure 31). Elsewhere, there was very little injury this year.

OTHER DIEBACKS, DECLINES AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Ash Dieback			See narrative.
Birch Decline			See narrative.
Drought	Red Maple Black Cherry	Widely Scattered	Some dieback attributed to 1995 drought.
	Sugar Maple	Barnard	May be responsible for curled leaves on ornamentals.
Fertilizer Injury	Sugar Maple	Townshend	Ornamental.
	Balsam Fir	Dummerston	Chlorosis from high pH.
Frost Damage	White Ash	Tinmouth	From May frost. No frost damage reported on Christmas trees.
Girdling Roots	Sugar Maple	Springfield	Associated with dieback of roadside tree.
Hardwood Decline and Mortality			See narrative.
Heavy Seed			Not observed.
Hemlock Decline	Hemlock	Woodstock	Crown density and dieback stable in a plot established in 1995 to monitor thin hemlocks.
Improper Planting	Ornamentals	Throughout	Planting too deep is the most common problem.
	Hemlock	Chester	Dieback from planting too deep and in bags.
	Green Ash	Rutland	Baskets and burlap not removed leading to dieback.
Larch Decline	Eastern Larch	Northeast Kingdom	No new sightings. 29 acres mapped.
Late Second Flush of Growth	Oak Locust Box Elder Norway Spruce	Champlain Valley	

SPRUCE-FIR DIEBACK and MORTALITY



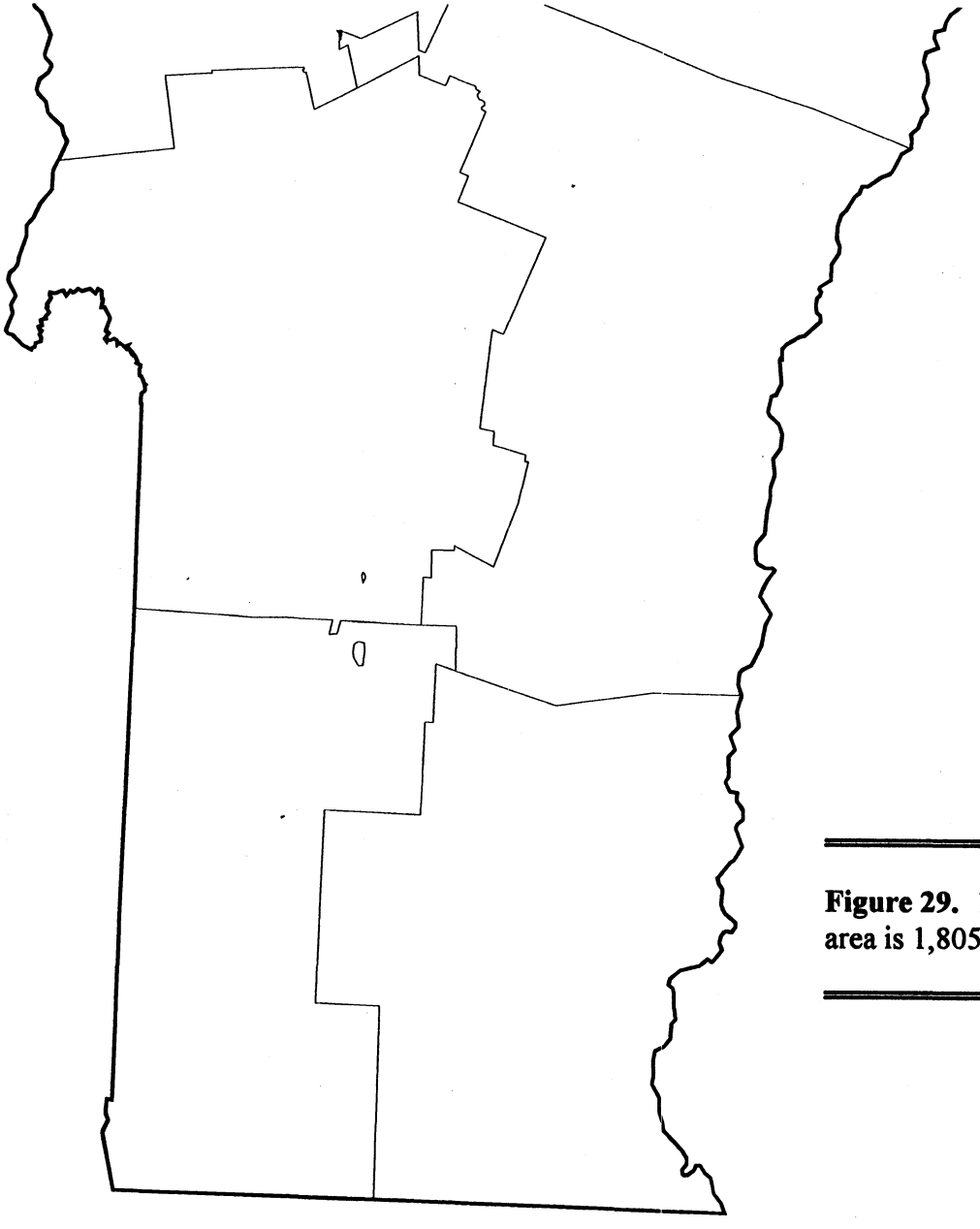
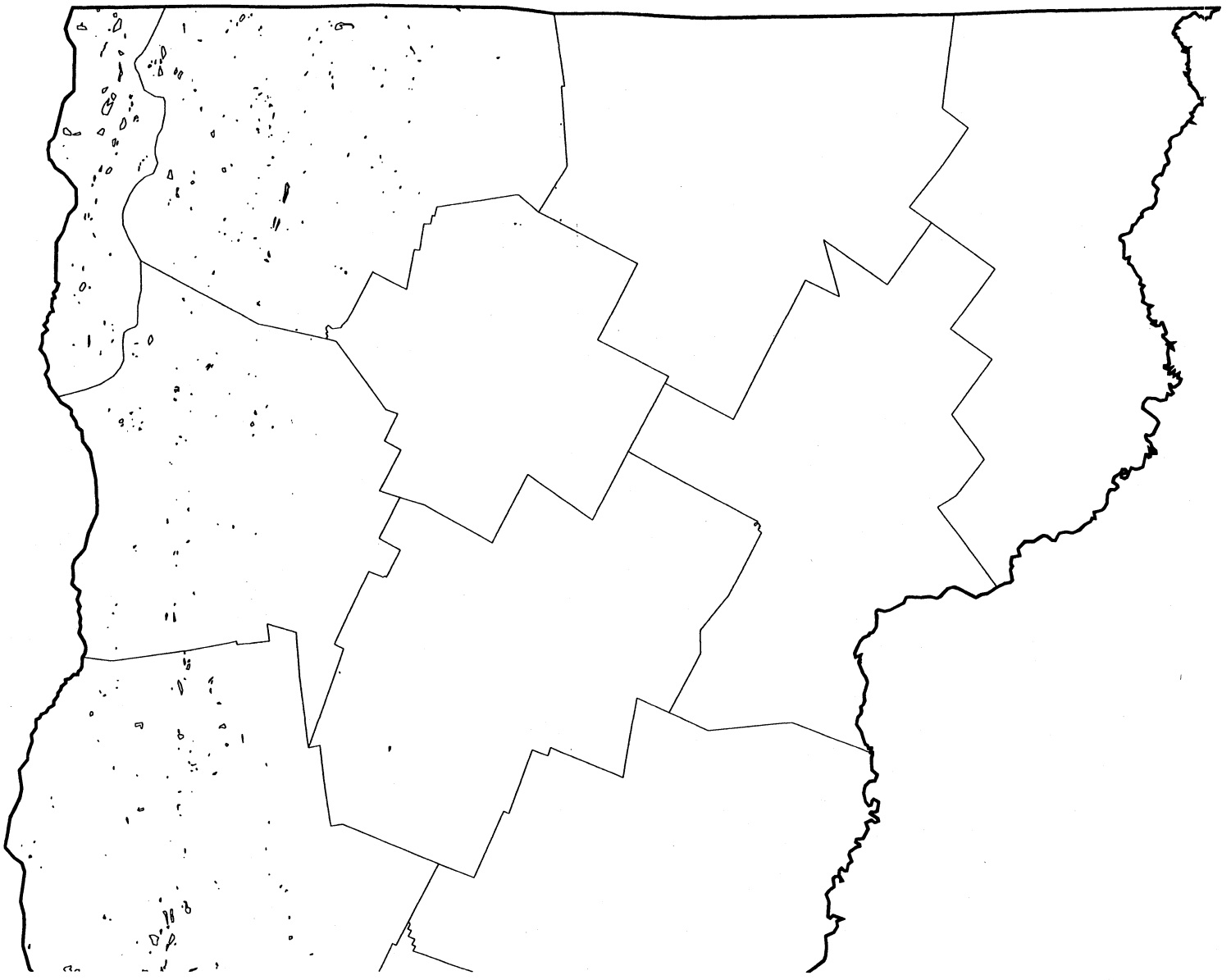


Figure 29. 1997 Spruce mortality and dieback. Mapped area is 1,805 acres.

WET SITE DIEBACK and MORTALITY



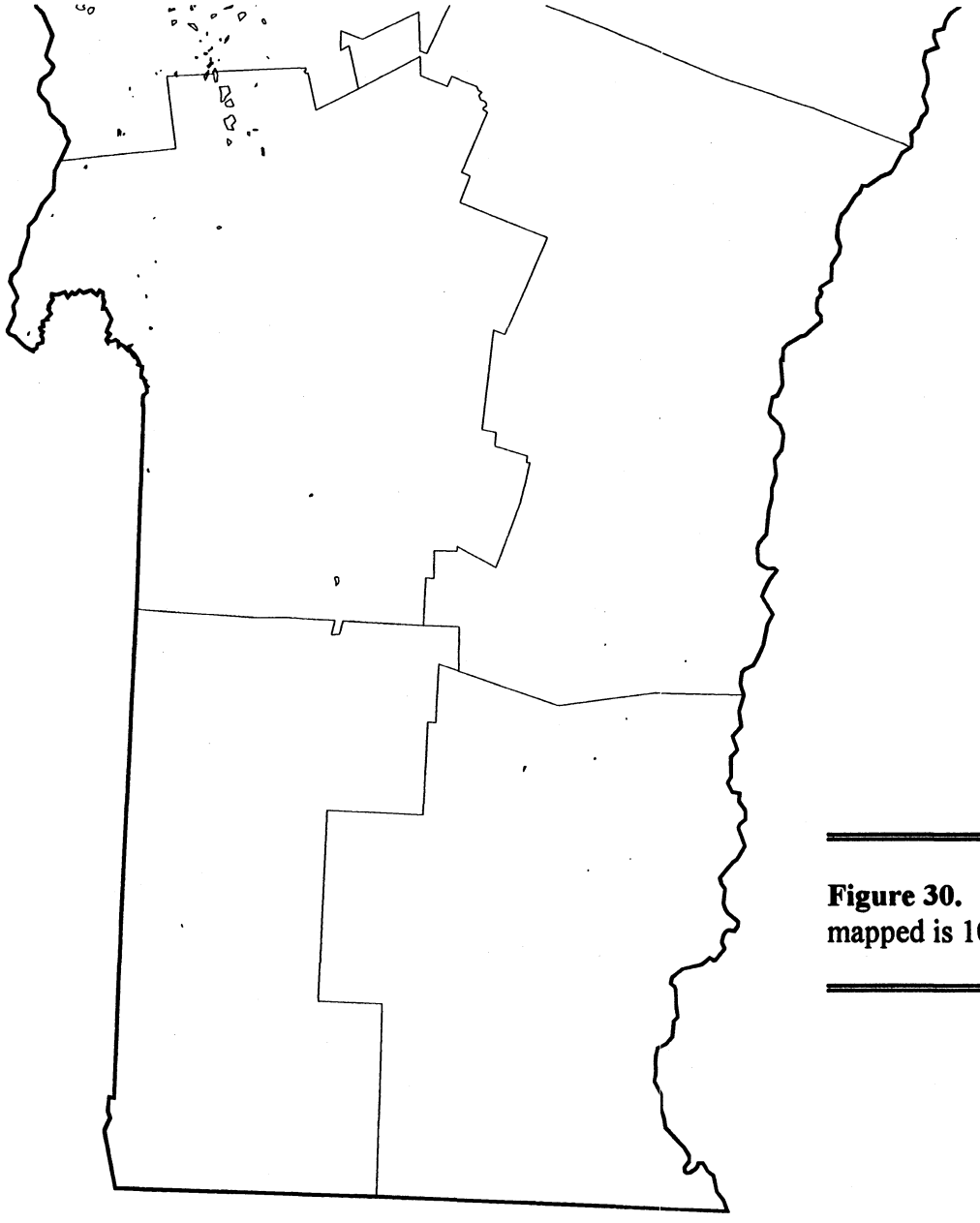


Figure 30. 1997 Wet site dieback and mortality. Area mapped is 10,297 acres.

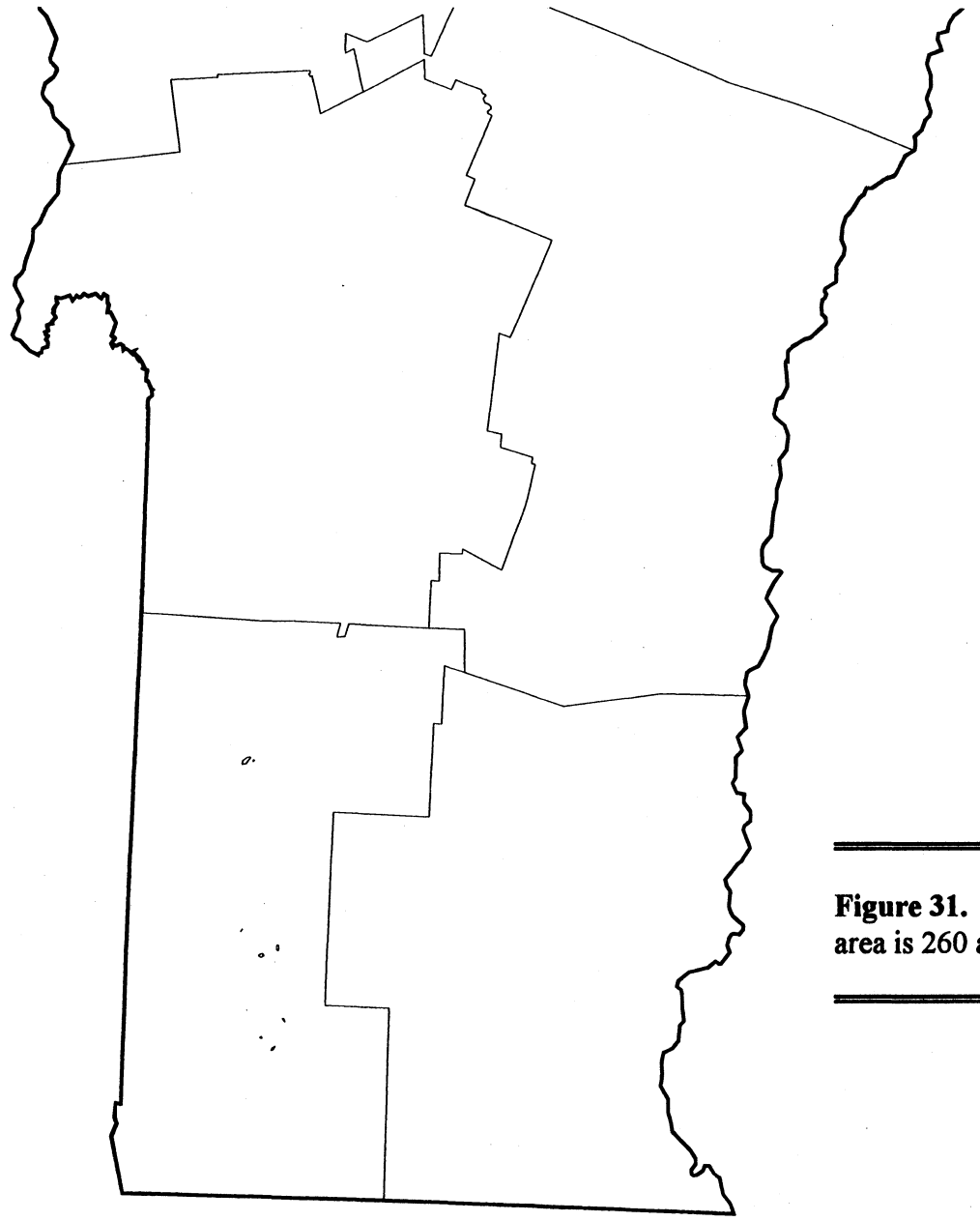


Figure 31. 1997 Winter injury of red spruce. Mapped area is 260 acres.

OTHER DIEBACKS, DECLINES AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Leaf Drop	Ash	E. Montpelier	Cause not determined.
Leaf Scorch	Sugar Maple	Brattleboro	Cause not determined.
Lightening	White Pine	Townshend	Initiated pockets of mortality in sawtimber pine. Lightening damage was followed by turpentine beetles, pine engravers, pinewood nematodes, and bluestain, but not root rot.
Maple Decline	Sugar Maple	Baltimore Rochester Shaftsbury Charlotte	Drought may be responsible for increase in woodland maple decline calls. See hardwood Decline and Mortality.
Mechanical Injury	Ornamentals	Throughout	String trimmers and lawn mowers a common cause of damage.
	Red Maple Sugar Maple	Chester Weathersfield Newfane	Dieback associated with wounding during construction on marginal sites.
Oak Mortality	Red Oak	Addison	Dead oak mapped on 34 acres.
Ozone Injury	Black Cherry Pin Cherry White Ash	Widely scattered	Injury, to sensitive species only, seen in 12 of 15 monitoring locations.
Pesticide Injury	Balsam Fir Blue Spruce	Orleans	Heavy damage to some Christmas trees sprayed with Roundup Pro after budbreak.
	White Ash	Woodstock	Defoliation and strap-shaped leaves on ornamental from TurfBuilder +2.
Salt Damage	White Pine Red Pine Norway Spruce	Throughout	Generally normal spring browning, less than 1996.

OTHER DIEBACKS, DECLINES AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Shedding of Conifer Needles			See narrative.
Snow Breakage	Many, especially White Pine & Silver Maple	Windham County	Damage from several winter storms.
Spruce Mortality			See narrative.
Wet Site			See narrative.
White Pine Needle Blight	White Pine	Springfield Manchester	Some trees, which have straw-colored foliage in spring every year, unusually thin in 1997. See Other Foliage Diseases.
Wind Damage	Balsam Fir Red Pine White Pine	Ripton	Microburst caused breakage and blowdown on Green Mountain National Forest.
Winter Injury of Red Spruce			See narrative.
Winterburn	Ornamentals		Very little injury seen this year. Some marginally hardy trees, shrubs, and other perennial plants suffered heavy dieback from winter injury. The many freeze-thaw events thought to be responsible.

ANIMAL DAMAGE

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Beaver	Many	Throughout	Many new ponds killing trees by flooding. See Wet Site Conditions.
Deer	Hardwoods	Essex & Caledonia Counties	Damage to new tree plantings.
		Rupert Lower Windsor Co. Elevations	Damage to regeneration.
	Arborvitae Ornamentals	Norwich	Heavy browse on ornamentals.
Moose		Addison, Franklin, Franklin, Essex, Orleans, & Caledonia Counties	Maple tubing damage continues; bark-stripping and breakage observed in the Northeast Kingdom.
Mouse		Caledonia County	Increase in girdling of ornamentals in the spring.
		No. Rutland County	Populations rising, but only one Christmas tree plantation with damage observed.
Porcupine	Many	Throughout	Stable. Little damage seen.
Robins	Christmas Trees	Shrewsbury	Deforming and breaking shoots.
Sapsucker	White Birch Scots Pine	Rutland Pittsfield Rochester Chester Castleton	Shade trees.
	Taps in Sugar Maple	Lincoln	Occasional damage.
Squirrel	Pine	Essex Junction	Heavy damage.

Miscellaneous Insects and Fungi

INSECTS IN HOUSES AND BUILDINGS

MISCELLANEOUS

INSECT	HABITAT	LOCALITY	REMARKS
Book Lice Psocids	At large in public building	Montpelier Burlington	Submitted to the lab on sticky traps.
Brown-banded Cockroaches *Supella longipalpa*	Household	Shaftsbury	Heavy population in home.
Clover Mites *Bryobia praetiosa*	Entering homes	Bennington	Readily distinguished from other household mites by their extremely long front legs.
Springtails Order Collembola	Entering homes	Burlington	Found around windows and thresholds.
Centipedes Order Chilopoda	Household	Newport	Usually found outdoors in damp locations, centipedes sometimes crawl into houses.
Millipedes Order Diplopoda	On outside walls of home	Essex	Hundreds-thousands seen climbing side of house.
	Inside home	Orleans	A few present inside.
Earwigs Order Dermaptera	Household	Essex Rutland E. Montpelier	Often inactive at night, hiding during the day; earwigs are gregarious and homeowners are especially alarmed when they see them in groups.
Firebrats Order Thysanura	At large in public building	Burlington	Submitted to the lab on sticky traps.
Fleas *Ctenocephalides* spp.	At large in public building	Montpelier	Submitted to the lab on sticky traps.

DIPTERA: FLIES

INSECT	HABITAT	LOCALITY	REMARKS
Drain Flies Family Psychodidae	In public and private bathrooms	St. Johnsbury Burlington Waterbury	Usually only a few larvae seen, but one case reported of clogged drain being filled with larvae.
"Humpbacked" Flies Family Phoridae	Household	Chester	Adults tend to be most abundant around decaying vegetation.
Dung Flies, *Leptocera* sp. Family Sphaeroceridae	At large in public building	St. Johnsbury	Often occur in large numbers around manure piles.
Grass Flies *Thaumatomyia* sp. Family Chloropidae	Around windows in public building	Montpelier	Vast swarms.
Heleomyzid Flies Family Heleomyzidae	At large in public building	Middlesex	Larvae feed in decaying plant or animal matter or in fungi.
Fruit Flies *Drosophila* sp.	Household	Shelburne	Persistent population, but food source eventually discovered and eliminated.
Dark-winged Fungus Gnats *Sciara* sp. Family Sciaridae	Household	Rutland Springfield No. Springfield St. Johnsbury Lincoln Montpelier St. Albans Middlesex Stowe	For a short period in the fall, fungus gnats abounded in homes, probably due to moist weather. Numerous at lights.
Cluster Flies *Pollenia rudis*	Household	Statewide	Average number of inquiries was received.
Blow Flies Family Calliphoridae	Household	Waterbury Barre Hardwick	Maggots found dropping through ceiling boards to the floor. Dead, maggot-infested animals were found in the attics.

HYMENOPTERA: ANTS, BEES AND WASPS

INSECT	HABITAT	LOCALITY	REMARKS
Cornfield Ants *Lasius* sp.	At large in and around homes and other buildings, on windshields, sidewalks, and elsewhere	Reports from Addison, Washington, Orleans and Caledonia Counties	These ants cause a lot of excitement during their mating flights in August and and September.
Pavement Ants *Tetramorium caespitum*	At large in public buildings	Bennington Woodstock	Found foraging in heated buildings throughout the year, though present in largest numbers in the summer.
Carpenter Ants *Camponotus* sp.	Household	Shelburne Montpelier Norwich	Roaming individuals and colonies reported.
Great Golden Digger Wasp *Sphex ichneumoneus*	Grounds around building	St. Johnsbury	Reported as abundant, these large, ground-dwelling bees were very active at this location.

COLEOPTERA: BEETLES

INSECT	HABITAT	LOCALITY	REMARKS
Black Carpet Beetle *Attagenus megatoma*	In windows	Corinth Barnard Irasburg	Adults fly readily and are attracted to sunlight. They feed outdoors on pollen of various flowers.
Varied Carpet Beetle *Anthrenus verbasci*	In buildings	Montpelier	Submitted to the lab on sticky traps.
Larder Beetles *Dermestes lardarius*	In private homes and public buildings	Barnard Shoreham Williston Burlington	Associated with pet food and other stored products, and cluster flies.
Sawtoothed Grain Beetles *Oryzaephilus surinamensis*	In candy	Lincoln	Heavily-infested, unopened bags of candy.

COLEOPTERA: BEETLES (CONTINUED)

INSECT	HABITAT	LOCALITY	REMARKS
Multicolored Asian Ladybeetle *Harmonia axyridis*	Household	Woodstock Norwich Lincoln Richmond	Fewer reports than last year.
Ground Beetle *Harpalus pennsylvanicus*	In FPR office	Waterbury	Common species that feeds on seeds and plant parts.

LEPIDOPTERA: MOTHS

INSECT	HABITAT	LOCALITY	REMARKS
Angoumois Grain Moth *Sitotroga cerealella*	Household	Danville	Moths widespread, food source discovered after much searching.
Indian Meal Moth *Plodia interpunctella*	Dried Flowers Grains	Morrisville Portsmouth, NH Rutland Shoreham	Infestations discovered when moths become plentiful.

PESTS OF HUMANS AND ANIMALS

ARTHROPOD	HOST(S)	LOCALITY	REMARKS
American Dog Tick *Dermacentor variabilis*	Dog	Montpelier	Immature stages feed on small rodents.
Deer Tick *Ixodes scapularis*	Human	Taken in NY	Removed promptly, victim reported no ill effects.
Woodchuck Tick *Ixodes cookei*	Calf's ear	Morrisville	Usually feeds on woodchucks and raccoons, but will feed on humans and domestic animals.
Tracheal Mites of Honeybees *Acarapis woodi*	Honeybees	Statewide	Not as big a problem as they were 4 years ago.
Varroa Mites of Honeybees *Varroa jacobsoni*	Honeybees	Statewide	Continue to be widespread, but bee-keepers are keeping mites under control. Where recognized and treated appropriately, hives are surviving well. Note: There has been some resistance to the miticide Fluvalinate reported in other states.
Fleas *Ctenocephalides* spp.	Cats and Dogs	Statewide	Received fewer calls than usual. Some fleas were recovered from traps in State buildings.

A note about honeybee populations: Numbers appear to have stabilized, and are now beginning to climb.

PREDATORS AND PARASITOIDS

Every year, predaceous and parasitic insects and other arthropods are submitted to the Forest Biology Lab for identification. Many people who make these inquiries know that these organisms are not harmful to our trees and shrubs, but others want to know if control options should be exercised to eliminate them. Notes on some of the 1997 inquiries follow.

Hymenoptera (wasps and bees)

***Megarhyssa* wasps**, sometimes called giant ichneumons, were reported on beech and maple from Waterbury Center, Middlebury, Greensboro and Lincoln. These large parasitic wasps fly from tree to tree, using their antennae to detect vibrations made by larvae of wood borers such as the pigeon tremex. Female wasps insert their long ovipositors into the wood to lay eggs in these larvae. After the eggs of the *Megarhyssa* wasp hatch, the immatures feed on the larvae of the wood boring insects. **Other ichneumonid wasps** were reported from Warren. Some species in this group are very host specific, attacking only one or a few host species, and others attack a wide variety of hosts.

Chalcid wasps, whose larval forms are internal parasitoids of Lepidoptera (moths and butterflies), Diptera (flies) and Coleoptera (beetles), were reported from Montpelier. Most chalcids are 2-7 mm in length, and many are black and yellow with various markings. These wasps are commonly associated with insects in trees and shrubs, and may be important agents in keeping pest populations at tolerable levels.

Pompilids, also known as **spider wasps**, were reported from Barnard. Most members of this family are dark-colored, with yellowish or smoky wings. Adults are often seen moving furtively across the ground in search of spider prey. These wasps capture and paralyze spiders, move them to a suitable place, and lay eggs in them.

Coleoptera (Beetles)

Several species of **ground beetles (Carabidae)** made their way to the lab this year. Members of this family are commonly found under rocks and logs. Many hide during the day and feed at night, and they are often attracted to lights. The majority of ground beetles are predaceous on other insects.

Carabus auratus, a big, green, shiny species of ground beetle that was introduced into the Boston region from Europe as a possible predator of the gypsy moth, was first collected in Barre, Vermont in 1942. By 1950, they were in Plainfield, by 1970, in Calais and Johnson, and by 1991, in Craftsbury and Sheldon. This year, *Carabus auratus* was reported from Waterbury, Jonesville, and Plainfield. The beetle eats slugs, worms, and cutworms.

A color form of the uncommon ground beetle ***Diplochiella striatopunctata***, with the wing covers alternately striped red and black, was collected at Half Moon Cove in Colchester. Normally, the beetle is entirely black. It lives near pools in seasonally-flooded lakeside forests, where it feeds on snails.

There were several inquiries and some reports about **tiger beetles (Cicindelidae)** in 1997. The name "tiger beetle" refers to the predatory habits of these insects, and also, perhaps, to the fact that some species have white stripes. Tiger beetles feed on small insects and other arthropods. Adults search the ground surface, while larvae construct burrows and ambush passing prey. Aside from several reports on our more common species, Ross Bell of UVM reported the sighting of ***Cicendela rufaventris***, a new record for Vermont. At the confluence of the Huntington and Winooski Rivers, Jonathan Leonard found the cobblestone tiger beetle, ***Cicendela marginipennis***, known previously in New England only from the Connecticut and White Rivers, and listed as threatened in Vermont.

We received fewer inquiries this year on ***Harmonia axyridis*, the multicolored Asian lady beetle (Coccinellidae).** This species, introduced into the southern US to combat pecan pests, has moved into our region and frequently enters homes in the fall. During the summer months, there were several reports from Addison County on predation of balsam twig aphid in Christmas tree plantations by the lady beetles.

One **net-winged beetle (Lycidae),** collected in Stockbridge, was submitted to the Forest Biology Lab for identification. These beetles are soft-winged, with a network of raised longitudinal ridges on the wing covers. Adults occur on foliage and tree trunks, feeding on decaying plants parts and sometimes insects. Larvae are predacious.

Hister beetles (Histeridae) in the genus *Hololepta* were collected from a butternut log from Duxbury. Adults and larvae in this group are predacious on other insects. The specimens emerged from a log that was loaded with *Magdalis* weevils.

Neuroptera (Lacewings and Dobsonflies)

Green lacewings are seen commonly on leaves of trees and shrubs, and a few are sent to the lab for identification every year. Adults and immatures feed on aphids and other soft-bodied insects.

The **dobsonfly**, whose immature form is known as a **hellgrammite**, is one of our largest and most formidable-looking insects. The huge adults, whose wingspan may be 5 inches, have long mandibles, but these not used for consuming prey. Rather, they are used to clasp the mate during copulation. These insects do not feed in the adult stage, but the immature form preys on aquatic insects. Specimens were received from Moscow and Waterbury.

Mecoptera (Scorpionflies)

So-called because the last genital segment of males may look like the scorpion's "stinger", the **scorpionflies** do not actually sting. These insects are found at edges of woods, or in open shade beneath hardwoods. Adults feed on fruits, nectar, and dead and dying insects, while larvae eat organic matter and may prey on insects. Specimens (***Panorpa* sp.**) were received from Morrisville in 1997.

Spiders

Requests for spider identifications came from throughout the state in 1997. As our dominant insectivores, they are common components of forest ecosystems. This year, we received **fishing spiders (*Dolomedes tenebrosus*)** from Morrisville and Springfield, a **grass spider (Agelenid)** from Morrisville, **orb weaving spiders (Araneids)** from Montpelier and Burlington, a **cobweb spider (Theridiid)** from Brandon, and an ***Argiope aurantia***, the showy yellow and black spider that is common in meadows and gardens, from St. Johnsbury. A specimen of ***Hogna rabida*, a wolf spider,** was collected from a basement in Morrisville.

Pseudoscopions

Pseudoscorpions are small arachnids that look like scorpions without tails. They live in a variety of places, including forest leaf litter, under bark or in dying trees, and in caves and intertidal zones, where they feed on small arthropods such as springtails and mites. Every year we receive a few calls reporting the presence of **pseudoscorpions** in homes.

Nematomorpha (Horsehair worms)

These long (usually 4-10 inches), threadlike, unsegmented worms (not arthropods, like other organisms described here) often emerge from insects that we have captured in our light traps. Occasionally someone will find one in their garden, and send it to the lab for identification. Horsehair worm eggs are usually laid in water. Larvae emerge from the eggs, have a brief period of free-swimming, then encyst on the surface of vegetation. When an insect like a caterpillar ingests the cysts with the vegetation, the walls of the cyst dissolve and the horsehair worms take up a parasitic residence in the host insect, where it eventually reaches adulthood. Adults are free-living and are sometimes found in standing water or garden soil. This year, we received a report of **horsehair worms** from Underhill.

MISCELLANEOUS INSECTS

ARTHROPOD	HOST(S)	LOCALITY	REMARKS
Andrenid Bees Andrenidae	In ground around home	Springfield	Bees nesting in burrows in the ground were numerous.
Bark Lice Psocids	Hardwood stand Pines	Widespread	Large aggregations reported, but not as numerous as some years.
Blister Beetle *Meloe angusticollis*	Lupine Meadows	Danville Bolton Addison Co.	Adults seen in fall.
Easter Lubber Grasshopper *Romalea guttata*	At large	Brattleboro	Found alive on a bicycle rack near a tractor-trailer transport depot.
Harpalus caliginosus (Ground Beetle)	Found in home	Lincoln	4th record of this beetle for Vermont.
Leconte's Haploa *Haploa lecontei*	Hardwood stand	Lincoln	Larvae feed on apple leaves.
Pink-spotted Dart (caterpillar stage) *Xestia bicarnea*	On snow in sugarbushes and hardwood stands	Shrewsbury Pittsford Elsewhere in southern Vermont	Scattered presence in snow, occasionally numerous.
Sowbug *Trichoniscoides sarsi*	In duff around maple	Lincoln	NEW RECORD FOR VERMONT!

MISCELLANEOUS FUNGI

FUNGUS	HOST(S)	LOCALITY	REMARKS
Artillary Fungus *Sphaerobolus stellatus*	In mulch around home	Monkton	Homeowner concerned about seemingly unremovable spores on windows and siding.
Stinkhorn Fungus *Mutinus caninus*	Hardwood stand	Monkton	Locally abundant; carrion-like odor attracts flies.

This information about forest condition is from the North American Maple Project (NAMP) plots.

Sugar Maple

Sugar maple trees in most plots surveyed have remained healthy (≤ 15% dieback) for the last 9 years (Figure 32). In 1997, 93.4% of overstory sugar maple trees were healthy, a slight improvement from 1996. Similar indicators of improved or stable health were a decrease in average foliage transparency (the amount of light coming through tree crowns) and a slight decrease in average dieback (Figure 33). New mortality was stable at 0.7%. Overall, the sugar maple stands surveyed were generally healthy.

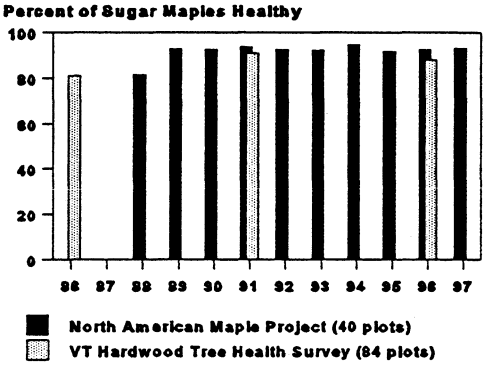


Figure 32. Percent of overstory sugar maple trees in North American Maple Project and Vermont Hardwood Tree Health Survey plots with ≤ 15% dieback (considered healthy) 1988-1997.

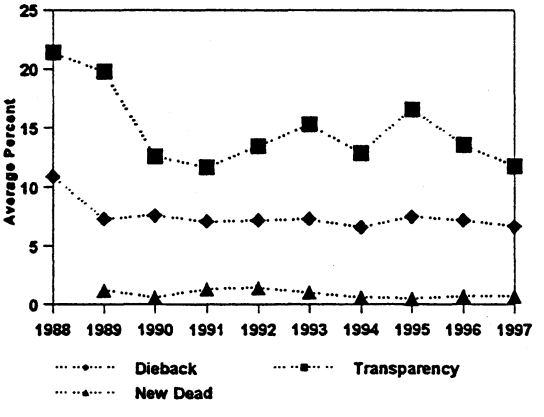


Figure 33. Average percent transparency (amount of light coming through foliage), dieback and new mortality, of overstory sugar maple trees on the North American Maple Project plots, 1988-1997. Data are from over 1,900 trees.

Taphole closure data is also recorded on NAMP plots as another indicator of tree vigor in stands tapped for maple syrup production. In 6 of the 40 plots, trees had greater than 2 open tapholes per tree in the summer. While it is not clear how taphole closure affects overall tree health, half the sites with poor taphole closure also exhibited other indications of poor tree health (high dieback and transparency).

Other Hardwood Species

Other tree species on NAMP plots like yellow birch and beech also improved in crown condition over 1996. Red maple and ash, however, had fewer trees in a healthy condition (Figure 34).

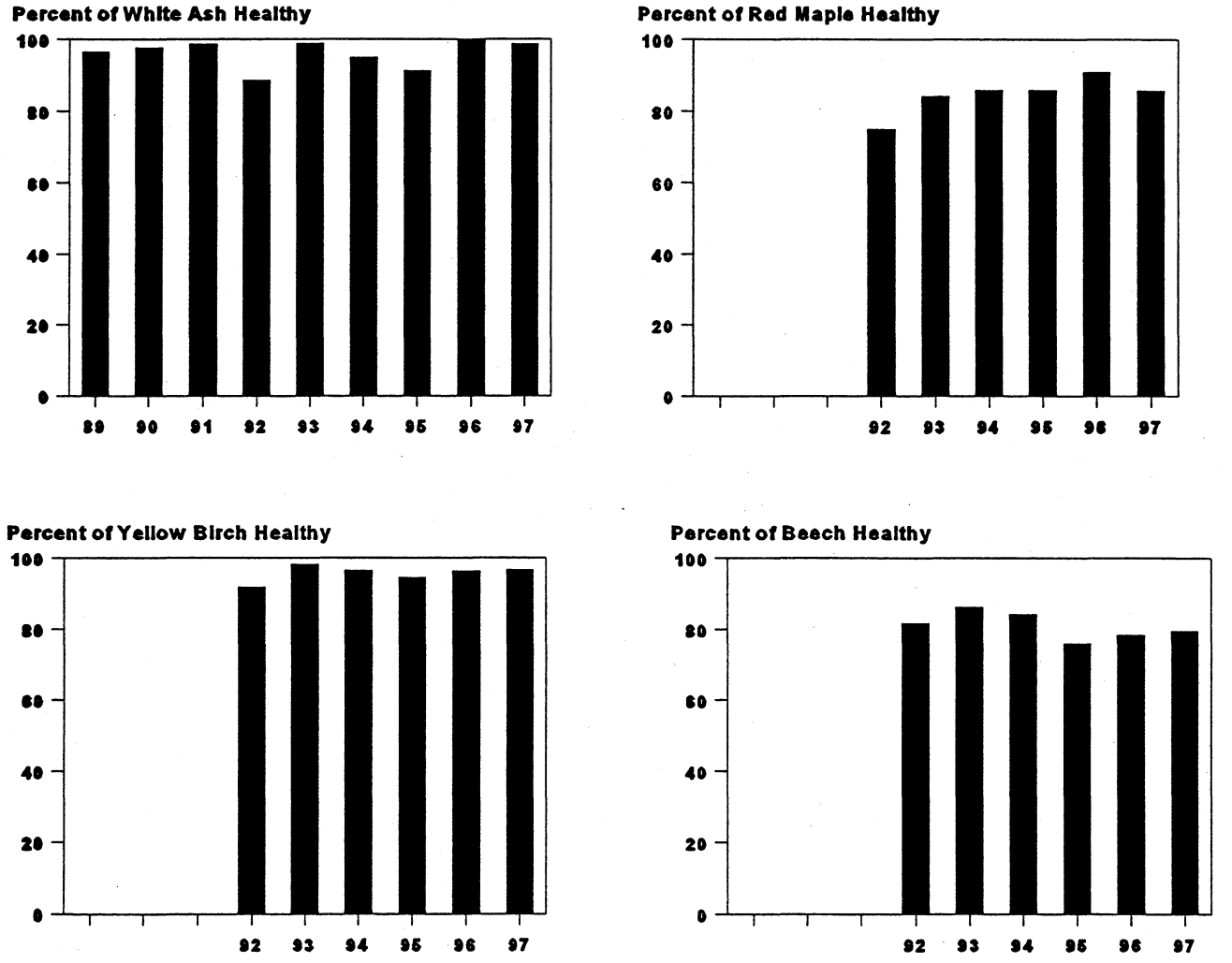
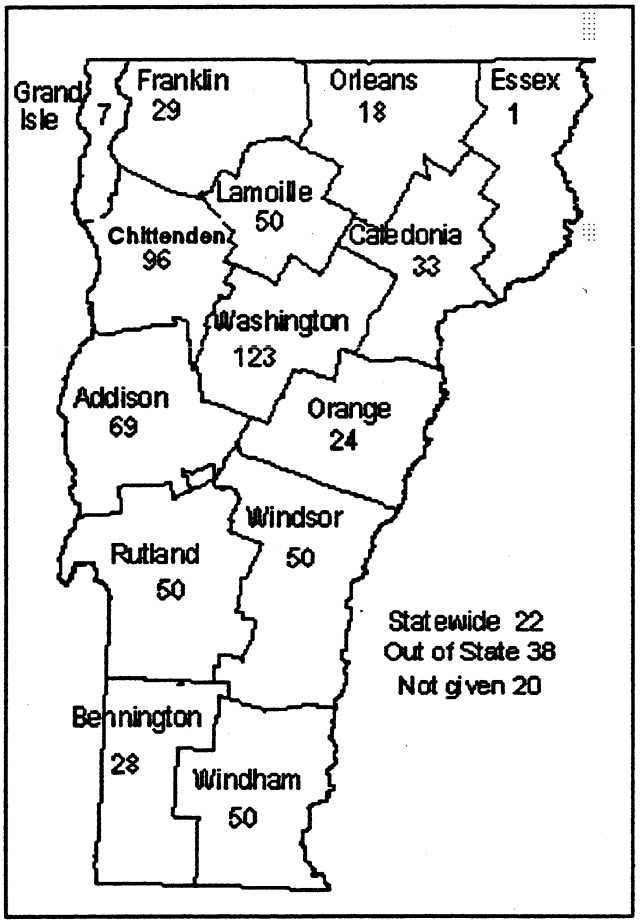


Figure 34. Percent of overstory trees in North American Maple Project plots with ≤ 15% dieback (considered healthy) by species, 1989-1997.

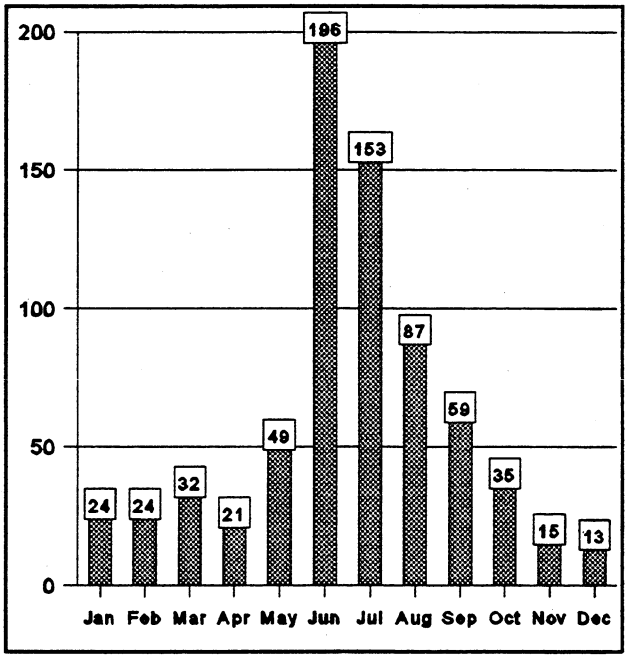
FOREST BIOLOGY LABORATORY -1997

How many inquiries did we receive in 1997? We had 708 requests for identifications, advice and information at the Forest Biology Laboratory this year, up from 461 in 1996.

How did numbers of requests vary throughout the State? The number of requests per county ranged from 1 in Essex County to 123 in Washington County.



How were numbers of inquiries spread out over the year? We received our highest number of requests (196) in June, with July and August following.



Why were numbers of inquiries in June of 1997 more than double those of 1996? The potential threat of the Asian longhorned beetle to Vermont forests made lots of people uneasy during the summer of 1997. At the Forest Biology Lab in Waterbury, we received about 230 actual specimens of beetles, most of which were *Monochamus scutellatus* (whitespotted sawyer). We also received *M. notatus* (Northeastern sawyer) and one lovely specimen of *M. marmorator* (balsam fir sawyer). County foresters and personnel in FPR district offices received specimens and inquiries throughout the summer, bringing the total number of requests to FPR for identifications and information to over 400. In addition, we had educational inquiries from institutions such as schools, libraries, and town clerk offices, and we provided information to news media, such as tv, radio and newspaper.

We received many other longhorned beetles at the Forest Biology Lab in 1997, perhaps

because of the increased awareness of the public. Some of the species included *Xylotrechus aceris* (the gall-making maple borer), *Xylotrechus integer*, *Stictoleptura canadensis canadensis*, *Orthosoma brunneum* (the brown prionid), *Prionis laticollis* (the broad-necked root borer) *Brachyleptura rubrica*, *Neoclytus acuminatus* (the red-headed ash borer), *Trigonarthris minnesotana*, and *Glycobius speciosus* (sugar maple borer). Other insects that were submitted to the Forest Biology Lab as "suspicious" included Pompilid wasps, which parasitize spiders, and various other large and showy beetles.

What hosts were involved? About 260 insect specimens we received were collected "at large". This means that they were not associated with a particular host, but were captured in flight, on a building, car, or other object, or were seen resting on a plant, but not feeding, ovipositing, or otherwise associating with the plant. Most of the "suspected" Asian longhorned beetles that were submitted to the Forest Biology Lab were collected at large. Otherwise, disease and insect specimens were taken from a variety of hard- and softwood hosts. Other inquiries (147 total) involved miscellaneous hosts or collection sites, or were requests for educational materials or resources. Most inquiries were tabulated on the basis of the host as indicated by the inquirer.

Host	Number	Host	Number
Apple	4	Cherry	5
Arborvitae	2	Dogwood	2
Ash	4	Elm	2
At large	260	Euonymus	2
Azalea/ rhododendron	2	Firewood	5
Balsam fir	21	Hardwoods	14
Beech	3	Herbaceous plants	8
Birch	5	Hemlock	3
Blue spruce	12	Household	34
Buildings	38	Houseplants	2
Butternut	8	Linden	2
Locust	2	Red maple	3
Maple	8	Red spruce	2
Misc. hosts and sites	147	Scots pine	4
Mtn ash	2	Spruce	10
Oak	13	Sugar maple	44
Ornamental	6	Vegetables	6
Pine	11	White pine	12

Who requested information from the Forest Biology Lab? The majority of inquiries (49%) came directly from the public. Forestry professionals made up 27% of our users, and educators comprised 12%. Other state agencies (8%) and commercial enterprises (5%) completed the user groups.

Public Inquiries	**345**
Vermont Forestry Professionals:	
VT Forestry Division (Forest Resource Protection, County Foresters, State Lands)	173
Consulting Foresters	15
	188
Educators	
Students (through high school)	10
Parks naturalists	10
University students and faculty	9
Teachers	31
Journalists	6
Librarians	5
Media	5
Extension	4
Museums	3
Town Clerk	1
	84
Commercial Enterprises	
Christmas tree growers, sugar-makers, direct	23
Nurseries, Landscapers, direct	7
Sawmill Operators	2
Store Owners	2
	34
Other State Agencies	
Buildings Division	40
Environmental Conservation	8
Agriculture	6
Fish and Wildlife	3
	57
TOTAL	**708**

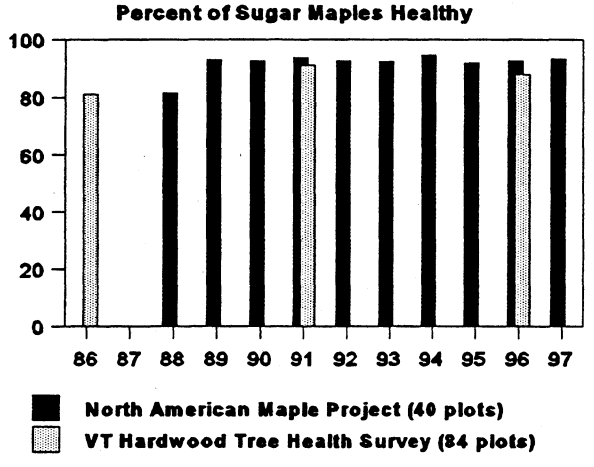
HEALTH OF SUGAR MAPLE IN VERMONT - 1997

Reported by the State of Vermont Department of Forests, Parks, and Recreation

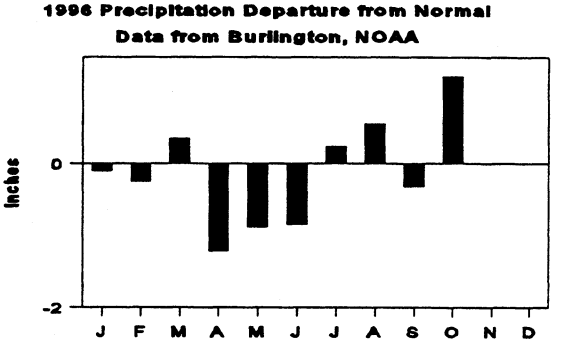
This information on health of sugar maple is based on aerial surveys and field observations by the VT Dept of Forests, Parks, and Recreation, the University of Vermont and the U.S. Forest Service.

First wet, then dry, then wet again, 1997 averaged out to be a fairly good year for growing trees. Winter was not too harsh. No major forest insects were at outbreak levels, moist conditions did not persist long enough to cause widespread fungus diseases, and low seed production meant that trees weren't diverting much food energy to reproduction.

The General Condition of maples was average for the past nine years according to the North American Maple Project. Foliage density improved from the levels measured in 1996. The Vermont Hardwood Tree Health Survey showed that sugar maples were in slightly poorer crown condition in 1996 than they were when last evaluated in 1991. This may be a response to the drought conditions experienced early in the 1995 growing season. No increase in severe dieback occurred during the past five years.



There is dieback in occasional sugarbush and woodlot sugar maples brought on by dry weather in 1995, perhaps enhanced by dry weather in mid-summer 1997. Some was associated with

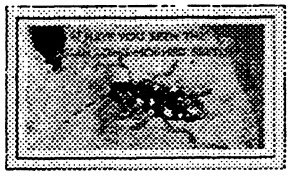


Sapstreak, caused by a fungus which infects trees through root wounds or recently cut stump surfaces, especially those made in late spring or early summer. When diseased trees are cut, the stump has a characteristic greenish stain pattern. To reduce sapstreak, avoid disturbing maples in May-July, insist on careful woodswork to limit basal wounding, and don't stack wood from diseased trees in the woods.

One maple defoliator, **Saddled Prominent**, was common this summer, but caused little defoliation. This caterpillar feeds in July through mid-August, often at the tops of trees. Look for signs of maple defoliation next summer: occasional caterpillars on the foliage of smaller plants, the sound of caterpillar droppings, or green leaf fragments on the ground. If this insect was feeding in your sugarbush in 1997, sampling next June can predict whether defoliation will occur later in the summer. Sugarbushes where defoliation is predicted may be sprayed with the organic insecticide, Bt.

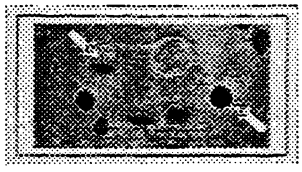
Maple Leaf Cutter, the insect that cuts brown circular holes in leaves, caused heavy browning to maple stands in widely scattered locations in Bennington, Caledonia, and Orange Counties.

There is no reason to suspect that the **Asian Longhorned Beetle** occurs in Vermont, but every possible sighting is being taken seriously because this insect thrives on sugar maple. An awareness campaign was launched to educate people about this beetle and encourage them to look for it. Of approximately 1000 requests for information, including beetle specimens brought in from 85 towns, most were native whitespotted sawyers, which breed in dying pines. Several beetle traps were tested around Morrisville.

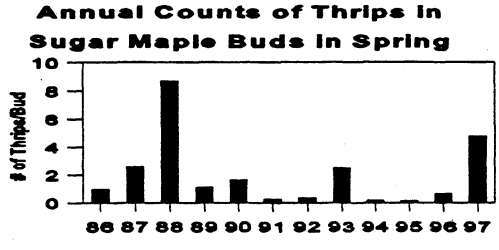


The Asian longhorned beetle is being eradicated from the two sites on Long Island where it was established. Before May, 1,200 infested trees were cut, chipped, and burned. An additional 500 infested trees have been identified; those that have not already been removed will be destroyed this winter. Surveys will continue for four years after the last infested tree is found and removed.

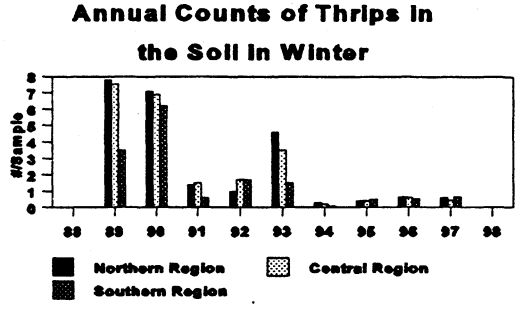
Keep an eye out for this beetle, especially between May and November. It is 1-1½ inches long, with very long black and white antennae. Its shiny black color and bright white spots give it its Chinese name, which translates to "stars in the night sky beetle." Also look for ½-¾ inch round



holes in the bark of maple, willow, birch, or poplar, with coarse sawdust accumulating around the base of the tree or at branch junctions. If you see a beetle that might fit this description, contact the UVM entomology lab at 656-5440, or the Dept of Forests, Parks, and Recreation at one of the numbers below. Also, to prevent the spread of this insect, encourage visitors from New York City and Long Island to leave their firewood at home.



There were many **Pear Thrips** in developing buds in the spring. Counts in southern Vermont were higher than they've been since the outbreak year of 1988. Thrips increased because sugar maple flowers were unusually abundant in the spring of 1996. When they feed on pollen, pear thrips produce more offspring. In spite of the high numbers and slow spring bud development, there was very little damage, because thrips emerged from the soil unusually late. Counts of thrips currently in the soil will be available in January.



For More Information: Insect and disease reports, and requests for identification, publications, and information on control, should be directed to the County Forester or Forest Resource Protection personnel at our district or county offices.

Addison	388-4969/879-6565
Bennington	372-1217
Caledonia	748-8787
Chittenden	879-6565
Essex	334-7325/748-8787
Franklin	524-6501/879-6565
Grand Isle	524-6501/879-6565
Lamoille	888-5733
Orange	479-3241
Orleans	334-7325/748-8787
Rutland	483-2314
Washington	479-3241
Windham	257-7967/886-2215
Windsor	296-7630/886-2215

Sugar Maple Management Highlights for the Region

from the

North American Maple Project (NAMP)

NAMP is an international study involving the United States and Canada to evaluate the condition of sugar maple throughout the region.

Are sugarbushes as healthy as other sugar maple stands?	NAMP has found that tree health (as measured by crown condition) is similar in sugarbushes and untapped sugar maple stands.
Are sugarbush trees more vulnerable to stress than untapped stands?	NAMP has found that sugar maple trees under both types of management responded the same to stress.
How much dieback is "normal" for sugar maple trees?	Over 90% of sugar maple trees monitored in NAMP have 0 to 15% crown dieback. Most of these trees are healthy and have an excellent chance of long-term survival, barring any significant future disturbance.
What is a "normal" mortality rate for sugar maple trees?	NAMP data shows that sugar maple trees die at a rate of 1.2% per year. There are some differences between overstory trees (0.9% die per year), and understory or suppressed trees (2.0% die per year). These results are similar to other studies on sugar maple mortality rates.
Should unhealthy trees be salvaged?	Crown condition can be used to indicate which trees will be surviving into the future. NAMP has followed tree health and survival over a seven-year period. Trees with 20-35% crown dieback had a 90-99% chance of survival and an 80% chance of returning to a healthy condition. Trees with more than 35% crown dieback had a 65% chance of dying or remaining unhealthy. These predictions could vary according to the cause of dieback. For example, trees with thin crowns due to insect defoliation are more likely to recover than trees stressed by poor site conditions. So, salvaging would be justified where dieback exceeds 35%.
Is it important to avoid injury to tree boles and roots during logging or sugaring?	NAMP information indicates that major bole and/or root damage may result in tree mortality. Crown dieback of 50% or greater is associated with bole and/or root damage. By avoiding injury to trees during thinning, sugaring or other entries, your opportunity for maintaining tree health is improved.

Sugar Maple Management Highlights - North American Maple Project (NAMP)

Is tap hole closure important to tree health?	Trees that close tapholes rapidly following the sugaring year produce more clear sapwood for future tapping. NAMP data shows that trees with greater than 35% dieback close tap holes more slowly. High dieback can be used as a signal to limit the number of tap holes. NAMP has found that vigorous trees tend to have fewer than 2 open tapholes in the summer following tapping.
What are the effects of insect defoliation and adverse weather conditions on tree health?	The impact of stress from defoliation or adverse weather on trees depends on many factors, such as the condition of trees prior to the disturbance, the site where trees are growing, and the timing and duration of the disturbance. NAMP results show that trees in areas defoliated by pear thrips or forest tent caterpillar for 1-3 consecutive years, and areas experiencing drought conditions for 2 years, had significantly thinner crowns, but normal foliage returned after 1-2 years. In these types of situations, where trees are exposed to a single stress agent for a short duration, tree recovery is expected to be good.
Is acid deposition stressing our maples?	NAMP has found that trees growing in areas with high levels of acid deposition have thinner foliage than those growing under medium and low acid deposition levels. While more long-term information is needed to understand this association, these results do indicate the possibility that sugar maples stressed by wet sulfate and nitrate pollutants have reduced leaf area.
Why is it economically important to maintain a healthy sugar maple forest, and how can it be accomplished?	Healthy trees translate into good growth, higher sap volume, and more resistant trees. Once a stand starts to decline it is difficult for the overstory trees to recover. There is some evidence (i.e. a Vermont study) suggesting that there is increased abundance of weedy ferns (hayscented) in stands with high dieback, which makes it difficult to promote future regeneration. A healthy stand begins with the site. Sugar maples grow best on loamy, well-drained soils, with pH values of 5.5 to 7.3. While sugar maples grow on a variety of soils and sites, less healthy trees can be expected on less favorable sites. Maintaining health will depend in large part on forest management practices. While tapping trees does not adversely affect health, avoid overtapping trees to maintain adequate new wood growth for future tapping. Delay thinning in woodlots with serious insect, disease or weather damage to avoid additional stress.

Produced by the Department of Forests, Parks & Recreation, 103 South Main St., Waterbury VT 05671. Nov. 1997.

COMMON PESTS OF CHRISTMAS TREES IN VERMONT 1997 REPORTED BY THE DEPARTMENT OF FORESTS, PARKS AND RECREATION

INTRODUCTION

Information in this report is based largely on a systematic annual survey of Christmas trees in northern Vermont as part of the Scleroderris quarantine and a smaller survey in southern Vermont. This year 261 acres were surveyed in northern Vermont. Observations by Forestry Division personnel throughout the state are also incorporated. Acreage trend information reported refers to changes in surveyed plantations in northern Vermont and are not statewide totals.

INSECTS

Balsam Gall Midge, populations continued to increase again this year and damage was detected in nearly all of the balsam fir Christmas tree plantations surveyed in northern Vermont. A plantation in Weston also received noticeable damage. Damage in some locations was the heaviest seen in many years, with nearly every needle in the upper third of some tree crowns galled. Outbreaks of gall midge are very cyclical and have been peaking every seven years in most locations. 1998 will be the seventh year since the last outbreak. Dissections of galled needles from two heavily infested plantations revealed that about 20% of the galls contained the non-gall-making-midge that ends up controlling the gall-maker. The beneficial midge should increase next year and reduce damage in the year 1999. However, **damage is likely to peak in 1998** and be heavier in most locations.

Growers who had damage this year should monitor their trees for adult midges laying eggs soon after bud break in 1998. If adults are present in noticeable numbers, they should be prepared to treat their trees after adults are done laying and new growth in the upper third of the crowns of favored trees averages 1½ to 2 inches long.

Balsam Shootboring Sawfly, populations declined dramatically in 1997. Balsam and fraser fir plantations examined during the regular northern Vermont Christmas tree survey received only trace (149 acres) to light (29 acres) damage. For the first time in ten years, no moderate or heavy damage was detected. Populations may be depressed due to cool wet weather the past two springs. Larvae collected in 1996 were frequently diseased and overwintering survival was very poor. At a few sites surveyed this year, a preference for fraser seemed evident. Populations are expected to return to higher levels in 1998 but should not be too serious.

Adults caught in emergence traps placed in areas of previous high populations decreased from 0.8 per square foot of soil in 1996 to 0.05 per square foot in 1997. Similarly, adults caught on 3" x 5" yellow sticky cards placed in mid-crowns of heavily damaged trees decreased from 3.1 per card in 1996 to 0.30 per card in 1997.

Adult emergence in Lamoille County during the past three years has always taken place primarily from the last week in April through the first week in May. However, the majority of adults have delayed laying eggs until maximum daily temperatures in May first exceeded 65°F. and stayed warm for several consecutive days. This occurred about May 5 in 1995, May 20 in 1996 and May 29 in 1997. As a result of the extremely late egg-laying this year, the majority of successful attacks in monitored plantations were on mid-breaking frasers and very late-breaking balsams. Where fraser fir predominated, no damage appeared on the balsams. If this relationship persists, monitoring of May temperatures may be the best way to determine spray timing. This may also explain why balsam fir receives the heaviest damage in some years while fraser fir receives the heaviest damage in other years.

Balsam Twig Aphid damage decreased in 1997. Damage in the balsam fir Christmas tree plantations surveyed was mostly moderate (70% of acres surveyed), with some trace to light damage. Damage in southern Vermont remained heavy in some plantations but was generally lighter than in 1996. Unlike 1996, no plantations surveyed were heavily damaged. Stem mother counts just before budbreak were much higher than in 1996, but this resulted in lighter damage than seen in 1996. Balsams from seven different seed sources in one Woodbury lot were evaluated in 1996 and 1997 for number of stem mothers and percent of branches damaged. An average of 1.5 aphids/sq.ft. in 1996 resulted in 86% of branches injured while 8.2 aphids/sq.ft. in 1997 resulted in 70% of branches injured. This indicates that factors other than number of aphids can play a large role in the amount of needle curling that occurs. It seems likely that the unusually cloudy, wet weather during shoot elongation in 1996 kept plant tissues succulent and contributed to the heavy damage seen. Our Elmore weather station, six miles from the Woodbury lot, received rain on 24 of the 42 days from May 20 (82% budbreak for Woodbury balsams) through June 30, 1996.

Cinara Aphids were detected lightly infesting 57 acres of pine and balsam fir. This is similar to last year, with small clusters that caused no visible injury.

Eastern Spruce Gall Adelgid damage to white spruce increased this year. Seventy acres were moderately infested. This is about 60 percent of the white spruce acreage surveyed.

Pales Weevil damage was not detected in 1997.

Pine Leaf Adelgid adults were detected on 116 acres of white pine but no shoot damage was reported.

Pine Needle Midge damage to Scots pine remained at levels similar to 1996. Seventy acres received moderate damage. At mid-summer, look for needles in the upper crown that bend downward at the fascicle.

Introduced Pine Sawfly injury to Scots and white pine was not observed this year, although empty pupal cases were easily found on downed white pine branches in Springfield this fall.

A Pine Fascicle Mite was less abundant this year, causing scattered small spots of yellow discoloration on shoots of white pine in northern Vermont. These spots darken and become less noticeable by the time trees are harvested.

Pine Shoot Borer injury to Scots and white pine was detected at only one site this year. These moth larvae survive best in hot, dry seasons.

Pine Thrips caused no noticeable damage to Christmas trees, for the first time in several years.

Pine Tortise Scale continued its presence on Scots Pine in Barre. Previously infested lower limbs have suffered some dieback.

Root Aphids were found on young chlorotic fraser fir Christmas trees in Bennington.

Sawyer Beetles were responsible for light balsam fir twig mortality widely scattered throughout the survey area. Reducing brush and slash is the best prescription to discourage this pest. Various native sawyer beetles were collected by people who mistook them for the highly publicized Asian Longhorned beetle. This exotic beetle is much shinier and more robust and is not believed to have yet reached Vermont.

Spruce Spider Mite injury decreased again this year. It has continued its presence in overgrown white spruce plantations. Damage to fir trees was not detected in the northern Vermont Christmas tree survey. Lighter populations than normal were also reported for southern Vermont. However, fall egg numbers were locally high, including locations in Danby, Pittsford, Bennington and Shaftsbury. This indicates that populations may rebound in 1998.

White Pine Weevil damage to pine and spruce Christmas trees remained common and overall damage was more noticeable than normal in much of the state. In the northern Vermont survey, white and Scots pine received light injury on 149 acres while blue spruce was moderately damaged on 52 acres. It has been observed that spruce receives heavier damage when mixed with pine. Best non-spray management is to prune infested leaders. In early summer, look for leaders with numerous punctures along with pitch flow and drooping shoots. Feel for soft and mined bark. Peeling back tissue will reveal frass and grub-like larvae.

DISEASES

A Balsam Fir Needlecast caused by *Lirula nervata* was again reported in one plantation in Cabot and another in Weston. Cleary's Protect T10 fungicide was applied to the Weston plantation but no symptoms have yet appeared on either sprayed or unsprayed trees. Trees will have to be evaluated in the spring of 1998.

Cyclaneusma (formerly *Naemacyclus*) and **Lophodermium Needlecast** of Scots pine remained common. Moderate damage was reported for 42 percent of the Scots pine area surveyed. Light damage was also reported from Townshend.

Delphinella Tip Blight of Fir has continued to be fairly common in northern Vermont balsam fir plantations since first reported in 1994. It was also observed on balsam fir in Rutland. This year, the disease was detected in five locations in Washington and Lamoille counties during the regular survey. Two of these plantations, one in Montpelier and one in Wolcott, have experienced continued infection. Both plantations are bordered by tall, native fir trees and had moderate to heavy infection this year. Two additional plantations, one in Johnson and one in Cabot, also had some moderate damage.

This disease really blossomed in the Wolcott plantation this year, causing some trees to look fire-scorched in early summer. Infection was also observed up the entire crown of native balsams of all sizes in the adjacent woods. Spray trials were conducted by the grower on one block of trees by applying Cleary's Protect T/0 fungicide plus sticker by mistblower. One application was made about a week after budbreak, with a second application 10 days later. This provided excellent protection from the disease. Treated trees averaged only 3% needle loss while untreated trees averaged 37% needle loss.

Diplodia (Sphaeropsis) Tip Blight caused by *Sphaeropsis sapinea*, caused widespread scattered shoot mortality of pine and fir throughout the Christmas tree survey area again this year. Frequency of the disease was similar to that seen in 1996 but infection was generally light. The tip blight was detected in 36 percent of the fir plantations and 47 percent of the pine plantations surveyed.

Fir-fern Rust infection was present in all of the northern fir plantations surveyed this year. However, damage was only at trace to light levels at all locations.

Rhabdocline and Swiss Needlecast of Douglas-fir continue their presence wherever Douglas fir is planted in Vermont. Levels of infection were light to moderate.

Rhizosphaera Needle Blight of Fir, caused by *Rhizosphaera pini*, first found to be causing serious needle loss in 1996 in a Danville plantation, was much more common and widespread in 1997. It was detected in three new locations during the regular Christmas tree survey but may have been missed in plantations visited early in the summer since symptoms don't peak until late summer. In late October, an additional 21 plantations in Lamoille, Washington, Orleans and Caledonia counties were visited, either at the request of concerned growers or as a spot check. The disease was present in 15 (71%) of these plantations and in all four counties. A sample of needles received from an Addison County plantation also had the disease present. The disease was also detected in Plymouth, Weston, Dover and Stockbridge, where it was seen in two plantations and was common on understory foliage of forest trees.

Damage was light in most locations, but of the 20 plantations known to be infected, damage was heavy enough to make some trees unsaleable in 5 of them. Damage was restricted to balsam fir except for light damage to frasers adjacent to infected balsams. Look for brown needles of normal size especially on current and last year's shoots, with some needles hanging straight down.

The disease was also present in wild balsam fir trees of all sizes in all four northern counties. In one location containing overgrown pole-size plantation fir, diseased needles were seen up the entire height of some tree crowns. Wherever wild or plantation balsams were infected with Delphinella Tip Blight, there was usually some *Rhizosphaera* present as well, but the opposite was not true.

Spray trials were conducted by a grower in Danville using Cleary's Protect T/0 and Bravo 500. Materials were applied with a back pack hydraulic sprayer after initial budbreak and again 1 week and 3 weeks later. Both materials significantly reduced needle browning on current growth but damage was still very noticeable on some treated trees. Dead attached needles from the previous year contributed to tree appearance. Also, it is unknown how often infection takes place, making spray timing a calculated guess until more is known about this fungus. For trees with rows running east-west, needle infection was greatest in these directions, particularly where branches overlapped with those of adjacent trees. Infection was at least 3 times lighter on the more open south sides of the trees where better drying conditions occurred.

Since this fungus is widely distributed, it could become a major problem in fir plantations if weather continues to be favorable to increased infection. Cultural methods to improve air drainage are probably the best approach to reducing future damage, since heaviest damage occurs in cold pockets and where trees are crowded or partially shaded. Good weed control, reducing tree crowding, basal pruning, and removing trees that are shading plantation trees are all measures that should reduce damage.

Rhizosphaera Needlecast of Blue spruce was present in fifty percent (99 acres) of the blue spruce plantations surveyed. Most infection was light.

Scleroderris Canker has not been found in any new towns since 1986. Seventeen Christmas tree plantations within the quarantine zone were inspected this year and found free of the disease.

Sirococcus Shoot Blight of spruce decreased since 1996. Two plantations, totaling 30 acres, were found with trace levels of infection. One plantation in Cabot had moderate infection, mainly due to crowding. Severe damage was discovered in a blue spruce plantation in Johnson that had been left unmanaged for a number of years.

White Pine Blister Rust damage remains common throughout the survey area. Eighty percent of the plantations surveyed had infection, generally restricted to scattered lateral branches and mostly at low infection levels throughout the state.

White Pine Needle Blight, increased this year. Sixty percent of the white pine plantations inspected had moderate infection and browning of roadside trees was very noticeable throughout northern Vermont, though less common in southern areas. This may be caused by a needlecast fungus identified as *Canavirgella banfieldii*, although there is not yet total agreement among scientists on this.

Woodgate Gall Rust damage to Scots pine was reported on 60 percent of the entire Scots pine plantations surveyed. All levels of infection were light.

Yellow Witches Broom Rust of balsam fir remains common in plantations where it has been reported in the past. Look for brooms in the spring, for they break bud earlier and are off color, thus easier to spot. The next step in control is the eradication of the alternate host, chickweed.

Herbicide Injury to balsam fir and blue spruce in Orleans resulted when Round Up Pro was sprayed after bud break.

Wet Site conditions resulted in the loss of fraser fir in Montpelier.

Fertilizer injury to tender shoots of balsam fir was observed at a few plantations throughout the survey. This resulted when granules were broadcast over foliage allowing some to settle on twigs, burning them. This injury appears similar to Diplodia shoot blight. Damage can be avoided by applying granules directly to the ground, avoiding contact with new foliage.

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